

New York State Department of Transportation

Intelligent Transportation System (ITS) Study for the Buffalo and Niagara Falls Metropolitan Area Erie and Niagara Counties, New York

OBJECTIVES, PERFORMANCE CRITERIA

&

USER SERVICE PLAN

Working Paper # 3

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1.0 INTRODUCTION

1.1 SCOPE

This paper is the third in a series that together will comprise an Intelligent Transportation System Study (ITS) for the Buffalo/Niagara Falls region. Working Paper # 1, Transportation Systems and Deficiencies, highlighted characteristics of the regional transportation system, plus problems within that system based on input from area transportation providers and users. Working Paper #2, Initial Identification of Institutional Issues, gave an initial survey of the agency and interorganizational barriers that impede the transportation system.

In this document, the problems identified in Working Paper #1 are critically reviewed to develop goals and objectives that address the problems. Next, user services from the FHWA National ITS Program Plan's (NPP) standard list are identified; where the NPP list does not contain an applicable user service, a user service specific to the Buffalo/Niagara Falls region is developed. Both the problems and user services are ranked based on inputs provided by critical stakeholders with an interest in area transportation, including time frames for implementation. Candidate actions that translate the user services into reality are also presented. Finally, performance criteria are introduced to evaluate how well any proposed actions meet goals and objectives. Together, these elements constitute a user services plan incorporating national priorities and compatibility standards, while maintaining a focus on the goals, objectives and needs of the region. Later, a system architecture will be defined and the market packages and technologies to implement these user services will be evaluated.

1.2 BACKGROUND

The ITS Study will provide a framework for implementation of ITS user services in the Buffalo/Niagara Falls region. ITS user services provide tools which can help use existing transportation resources more efficiently without increasing environmental and energy problems. Some user services are the presentation of value-added information to the user. For instance, the user service could provide information on travel conditions, or bus schedules. Some user services result in a more efficient manner of performing a task. For instance, the user service could provide the ability to accept electronic payment for use of a toll lane. ITS user services therefore involve collecting, transmitting, processing, distributing and displaying information whether that information is then the product itself, or the information is used to improve transportation services.

Each ITS user service is made up of several technologies such as advanced communications, mapping, or surveillance. National standards are being developed for the interfaces between the user service technologies. These standards will help ensure an ITS user or developer that products or services will be compatible. ITS compatibility standards are being guided by the National System Architecture. The national architecture will establish a rational framework to implement functional requirements of the user services. There are currently 29 user services defined in the NPP and addressed within the National System Architecture. Functional requirements of the 30th and 31st user services are being defined now and are also expected to be included.



1.3 OVERVIEW OF METHODOLOGY

There is no single answer to complex transportation problems of a fairly large metropolitan area. Among the possible actions, ITS user services are tools that can be a part of the overall solution. To incorporate the appropriate user services, the FHWA has defined an ITS Planning Process as a part of the NPP, as summarized in Figure 1-1.

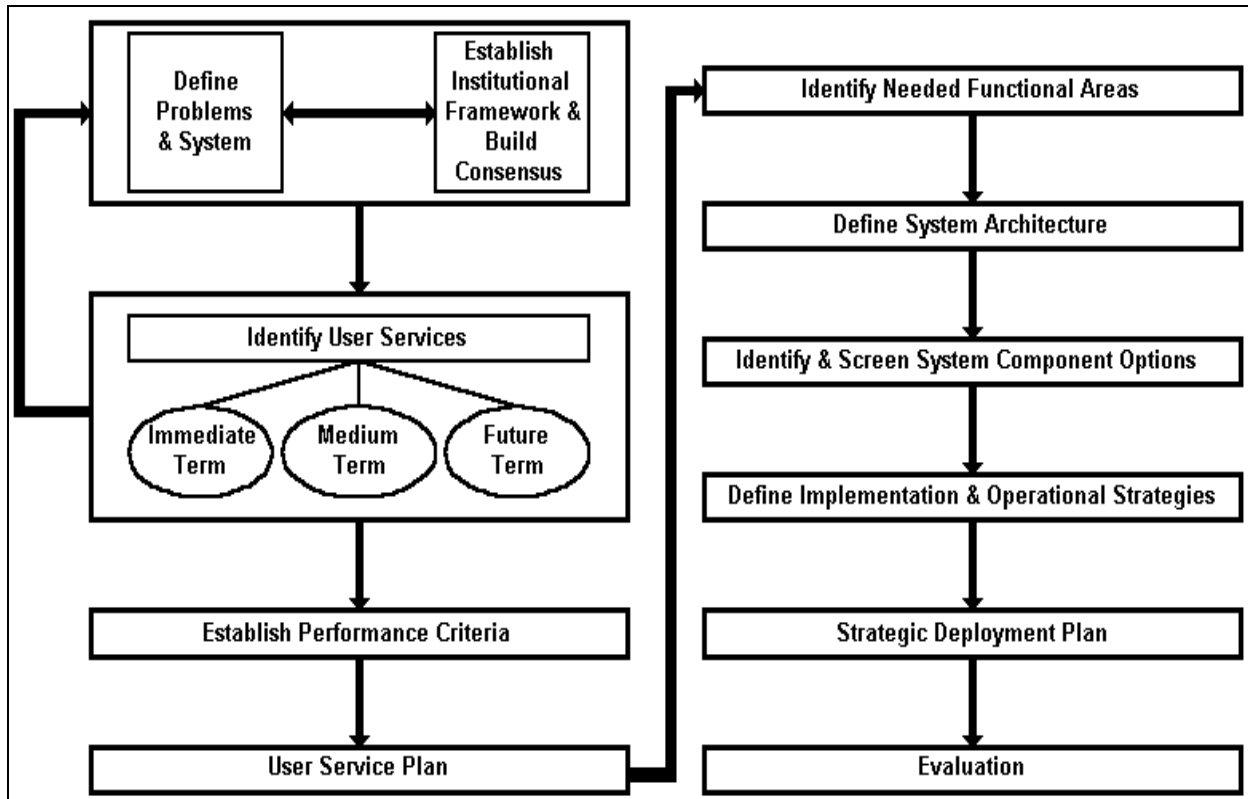


Figure 1-1 National ITS Planning Process

A systems engineering approach is used which includes:

- Define problems and system;
- Establish institutional framework and determine objectives;
- Identify potential user services;
- Establish performance criteria;
- Develop user service plan.

Once we have determined user services, we can then translate them into:

- functional requirements,
- develop an efficient system architecture and



- select appropriate technologies to implement the user services.
- At this point: a tactical implementation and operation strategy is developed based on technical screening and performance criteria.
- The implementation plan will next be developed using input from the Transportation Improvement Process and the State Implementation Plan.
- Finally, system owners will perform system evaluation using performance criteria developed in this report.

Throughout the process it is also important to keep in mind the following questions:

- Can ITS services improve existing operations or fulfill needs?
- Can ITS be incorporated into currently scheduled improvements?

In other words, the ITS planning process should be linked with the metropolitan and statewide planning processes. When early deployment projects have been identified, they should become a part of the Early Deployment Plan. In addition, the ITS planning process should be coordinated with ISTEA management systems, to the extent they are being pursued. In this way, ITS technologies to implement the user services can be built into construction of new facilities or reconstruction of existing facilities, for example, by including spare conduit and other amenities able to accommodate the installation of future ITS technologies.



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2.0 DEFINE PROBLEMS AND SYSTEM

This section presents an assessment of the transportation system and ranks problems and needs in the Buffalo/Niagara Falls region.

2.1 SYSTEM INVENTORY AND SURVEYS

A system inventory, surveys and interviews were used to determine problems and to begin identifying needed actions. Other problems were identified during an ITS User Services Workshop. Each of these efforts is detailed in the sections below. Working Paper #1 presents additional detail.

2.1.1 Transportation Systems Inventory

Data was collected from each transportation provider in the area including the New York State Department of Transportation (NYSDOT), the New York State Thruway Authority (NYSTA), the Niagara Frontier Transportation Authority (NFTA), the Ministry of Transportation Ontario (MTO), the Niagara Falls Bridge Commission, the Buffalo and Fort Erie Public Bridge Authority and the Niagara Frontier Transportation Committee (NFTC). Information gathered included laneage, present and forecasted traffic volumes, congestion and level-of-service, with the intent of determining system uses and needs. In addition to the overall system operation, specific existing or imminent ITS projects were identified to determine the ITS infrastructure base.

2.1.2 ITS Survey of Transportation Needs - Transportation Agencies

Transportation agencies in charge of providing the transportation systems were also surveyed with a written questionnaire. These public agencies included the New York State Department of Transportation, the New York State Thruway Authority, the Niagara Frontier Transportation Authority, the Ministry of Transportation Ontario as well as several public works departments, police departments and bridge authorities in the area. The survey sought to determine specific problem areas within the agency's jurisdiction as well as potential success of candidate ITS user services. The public agencies were also asked to rank objectives for improving the transportation system in their jurisdiction.

2.1.3 ITS Survey of Transportation Needs - General Audience

This survey obtained opinions of a sample of transportation users, as opposed to transportation providers. The general survey was completed by employees of several large area corporations, such as Calspan, URS Consultants, Ecology & Environment, and bus drivers working for NFTA. Many of these were large engineering firms, although not all of the respondents were engineers. The respondents lived and worked in a widespread geographic area and viewpoints were obtained on different travel routes and modes.



Similar to the agency survey, the general survey requested improvement objectives as well as existing transportation problems and input on which user services would be appropriate to solve the problems. Evaluation criteria for user services were also obtained.

2.1.4 Follow-Up Interviews

Follow-up interviews to the agency survey were made with critical stakeholders to gain further insight into issues, problems and solutions.

2.1.5 ITS User Services Workshop

On June 20, 1996, a Users Services Workshop was held at the Buffalo and Fort Erie Public Bridge Authority (Peace Bridge) conference room. Attendance at the workshop included more than 20 critical stakeholders and members of the Niagara International Transportation Technology Coalition (NITTEC). These attendees represented public agencies, private interests and the bridge authorities (see Appendix A). Six tables were generated (Tables 1 through 6) for the workshop and completed by workshop attendees. These 6 tables are provided in Appendix A and described below.

To accomplish these tasks, the attendees were given an overview of ITS, regional traffic problems and existing ITS features, as well as a summary of the seven national ITS User Service Groups (or "bundles"), as shown in Section 4.

The workshop was held to refine the transportation needs and proposed actions for the Buffalo/Niagara Falls transportation problems. Most of the problems had been highlighted during the inventory/survey process and clarified during the follow-up interviews. The workshop helped build a consensus as to what problems were most important to the stakeholders. The workshop also provided the attendees an opportunity to provide input and feedback on the regional problems, user service goals, objectives and their priorities.

Regional transportation problems and needs were presented in draft form for review and discussion. Using the attendees' input, the problems and needs were revised, as presented in Table 1 (Appendix A). Workshop attendees next ranked the major categories of problems and needs in specific time frames. The priority level was two tiered in that a time frame was included for the problem to be addressed, as well as a ranking of high, medium or low priority within the time frame. It should be noted that a "low priority" does not necessarily mean the issues in question should not be addressed, merely that other issues need to be addressed first. Only one time frame could be picked for each category. A tally of the responses is provided in Table 2 (Appendix A).

Next the User Services Workshop was used to reach a consensus on the goals and objectives to solve each problem. The group "brainstormed" and the resulting list of proposed goals and objectives is provided in Table 3 (Appendix A).

The attendees then developed a list of appropriate user services to implement the goals and objectives. The ITS study team provided the necessary technical input and definitions of the user



services to guide the attendees in their selection. As shown in Table 4 (Appendix A), there are five new ITS user services which were identified by the attendees to meet specific goals and objectives of the Niagara Frontier. These new user services are Road/Weather Information Service; Customs/Immigration Inspection and Clearance; Interorganizational/International Management and Coordination; and Operations Management.

Finally, each participant at the User Services Workshop provided a priority listing of the user services. Again priority was defined by the time frame of implementation and the priority within that time frame (high, medium or low). All responses were tallied to develop the user services prioritization ranking provided in Table 5 (Appendix A).

Preliminary candidate actions for each user service was supplied to each attendee for informational purposes, as presented in Table 6 (Appendix A).

2.2 PROBLEMS, NEEDS AND PRIORITIES

The definition of transportation problems in the Buffalo/Niagara Falls area was based upon a review and discussions of issues as defined quantitatively and qualitatively in the system inventory and at the User Services Workshop. The problem areas are summarized below.

2.2.1 Congestion

Relieving roadway congestion was cited as the number one way to improve the movement of people and goods in the area. Both arterial and expressway systems were identified as having recurring congestion during the peak travel periods. For example, the New York State Thruway from Southtowns to the airport as well as portions of the Youngmann Expressway to the airport have heavy congestion during the peak periods. Portions of the Kensington Expressway (NY 33) and NY 5 are also congested, along with Transit Road (NY 78), the QEW and PH 405.

The User Services Workshop Attendees cited several influences on area travel congestion which included: lack of staffing for incident management, service patrols and police, causing response delays; disabled or parked cars and special events as contributing to traffic delays, queuing and, ultimately, congestion; manual toll collection; major activity center destinations; increasing volumes during the peak hours; and an inability to build more capacity or divert traffic. Appendix A, Table 1 provides a summary of the area's probable congestion causes and their effects. The critical stakeholders ranked each problem category, as shown in Table 2 (Appendix A), and congestion ranked second only to funding in overall priority.

2.2.2 Weather Related Conditions

Critical stakeholders were concerned about road surface (e.g. icing), high winds, and blowing/drifted snow on the raised portions of NY 5 along Lake Erie where lake effect snows and winds create a hazard. Workshop respondents added fog, heavy rains, floods, ice blockages, disabled/abandoned vehicles and parked cars to the list of weather related conditions over the entire



region. Resulting problems, as listed in Table 1(Appendix A) include decreased capacity of roadway, poor visibility and accidents. As shown in Table 2(Appendix A) , critical stakeholders ranked weather related conditions as a middle priority at the User Services Workshop.

2.2.3 Safety/Incidents

Several high accident locations exist in the region. Most are concentrated on the eastern half of the inner loop (NY 33 and NY 198) as well as NY 33 from the inner loop out to the airport. High accidents were also cited along the QEW and the PH 405, PH 420, and PH 3. As shown in Table 1 (Appendix A), probable causes for safety problems and incidents include geometric problems and vehicular breakdowns resulting in primary and secondary accidents, personal insecurity, and congestion.

With significant congestion and accident occurrence, most attendees felt it was necessary to improve accident management. The formation of the Western New York Incident Management Team (WNYIMT) demonstrates that support for this effort already exists. However, no automatic vehicle detection or incident detection capability currently exists, and there is no common framework for interagency communications and coordinated management of the transportation network. The incident detection capability that does exist in the region is labor intensive, relying on field personnel being at the right location at the right time to report on an incident in a timely fashion. Dissemination of congestion and alternative route information to the traveler exists only through AM radio traffic reports. Overall, incident management and network traffic management is difficult to perform. While there are several variable message signs in the region, without timely incident detection data or a supportive communications system, the usefulness of variable message signs is limited. Because of currently limited use, some of the public perceives the variable message signs as a misuse of taxpayer dollars.

As shown in Table 2 (Appendix A) , safety incident problems were ranked as a medium priority.

2.2.4 Border Crossings

Congestion occurs at the four international border crossings during the morning and evening peak periods as well as weekend peaks. The attendees cited customs and immigration as a major stumbling block to efficient operations and customs/immigration pre-clearance was cited as one of the top system objectives for improving the movement of people and goods. Commercial vehicles at the borders were cited as causing a great deal of delay.

Table 1 lists the probable causes for problems at the border crossings. Besides problems caused by customs and immigration processes, the critical stakeholders cited capacity and facility infrastructure constraints, plus lack of staff as causing congestion and inefficient operations. Inadequate traffic channelization/signing leads travelers crossing the border to confusion and accidents.

To facilitate use of ITS at border crossings, bridge authorities, US Customs and Immigration and Naturalization Services and customs brokers (e.g., CJ Tower, Inc.) have been identified as critical



stakeholders. The region is currently studying various ITS technologies, including "one-stop" shopping combining commercial vehicle credential checking, automatic toll collection and automated customs and immigration data processing. Table 2 (Appendix A) ranks border crossing problems as the fourth highest priority in the immediate term by the attendees at the workshop.

2.2.5 Interorganizational / International Cooperation

The attendees identified the need for improved interagency coordination. Table 1 lists the many problems and their effect on the transportation system.

The agencies indicated that achieving full interorganizational/international cooperation would be challenging. They also felt making a determination of centralized versus autonomous processes on a regional basis would be difficult, due to the many organizations involved with differing concerns.

Table 2 (Appendix A) ranks interorganizational/international cooperation as a high priority need. The responding agencies indicated a willingness to share information among agencies, but stated their ability to do so was somewhat hindered by a lack of enabling infrastructure beyond phone and fax communications. This limitation can affect their ability to coordinate maintenance and reconstruction schedules.

2.2.6 Transit Services

Several respondents commented on the need or desirability of improving transit service in Buffalo. The transit system includes park-and-ride facilities, bus routes and one light rail transit line. Transit in most areas, however, is not heavily utilized. The NFTA is currently restructuring the transit system to better serve their clients. Table 2 (Appendix) ranks transit as having a medium priority in the mid-term.

2.2.7 Funding

Attendee funding needs included both operating dollars and capital improvement dollars for ITS projects. The attendees felt it would be extremely difficult to acquire program funding for operations and maintenance, which leads to an inability to develop, operate or maintain an ITS infrastructure. Funding was ranked as the highest immediate priority.

The Niagara International Transportation Technology Coalition (NITTEC; see Working Paper #1) is attempting to set up a \$5 million revolving fund for region wide ITS projects. Unfortunately, the fund has been tied up in the State Legislature.

2.2.8 Operations and Maintenance

As Table 1 (Appendix) indicates, operation and maintenance problems consist of on-going activities such as snow and ice removal, pothole repairs and the impact of reconstruction activities on traffic. The attendees identified the need for additional staffing, stating it would be difficult to increase the



work load of existing operations and maintenance personnel to include ITS. Table 2 (Appendix A) shows that operations and maintenance problems were given a high to medium priority for the immediate time frame.

2.2.9 Recreational Travel / Tourism

The region is a major tourist destination due to the presence of Niagara Falls and Horse Shoe Falls. In addition, several other existing and proposed attractions generate tourist trips, including a proposed gaming casino in downtown Niagara Falls, Ontario, just over the international border.

Recreational trips and tourists trips are often made by drivers who are unfamiliar with the area. To such drivers, trail blazer signing, travel condition reports and alternate routing information can be very important. Table 1(Appendix A) also cites a perceived lack of information by the attendees on how to prepare for border crossings by recreational travelers, thus leading to confused drivers at the crossings. Table 2 (Appendix A) shows that due to the many recreational travelers, this problem / need category ranked in the immediate implementation time frame, albeit at a lower priority.

2.2.10 Privacy

Agencies were concerned over autonomous operation of regional facilities and protection of proprietary data. At a broader national level, the issue of privacy with ITS technology that can identify individual travelers and their location is a serious concern. Table 1 (Appendix A) lists these causes as affecting travel time data collection/dissemination as well as contributing to a reluctance to support certain ITS solutions. Privacy was ranked as a medium to low priority for solution implementation in the 5 to 10 year time frame as shown in Table 2 (Appendix A).

2.2.11 Public Support

Table 1(Appendix A) cites a perceived lack of knowledge of ITS benefits among the general public. Additionally, with the phased installation of variable message signs (VMS) for an en-route traveler information system and its currently limited data display, the traveling public currently doubts the value of a variable message sign system. The result has been some negative press and a potential lack of public support for future spending on additional similar installations.



3.0 INSTITUTIONAL FRAMEWORK

Ongoing institutional coordination and a commitment to operations and maintenance are prerequisites to make an ITS system work. Informing and educating the agencies and private interests in the study area on project scope, key objectives, schedule and deliverables, along with the benefits and capabilities of ITS technologies are key to establishing a consensus. This process was begun through an introductory letter to the critical stakeholders (February 15, 1996) that provided an overview of the Buffalo/Niagara Falls ITS Study. The introduction was also forwarded to all regional newspapers. Unfortunately, none of the newspapers had published it as of mid-July, 1996. The June User Services Workshop also served to build consensus on system problems, objectives and candidate user services.

Besides the ITS critical stakeholders, there are two organizations within the region that are involved in regional transportation coordination, as discussed in Working Paper #1. The Niagara International Transportation Technology Coalition (NITTEC) organization is pursuing technical solutions to regional problems and is improving cooperation among the various transportation providers. When implemented, NITTEC's \$5 million revolving fund will provide project loans for projects that improve mobility in the region. Preference will be given to those projects that promote trade or tourism, improve air quality or safety, or that show significant coordination and partnership among two or more NITTEC members.

The Western New York Incident Management Team (WNYIMT) is improving incident response on a regional basis. One of the aims of the WNYIMT organization is the education of motorists as to their responsibilities if they are involved in an accident. The aim is to educate drivers as to the importance of clearing their autos off the roadway to eliminate secondary accidents and to reduce delays to other motorists. These responsibilities have been disseminated to the public through the Automobile Association of America (AAA), Buffalo TV news shows and local newspapers. WNYIMT could be used to lead the efforts to further educate the public on the benefits of ITS and to build public support.

The list of ITS critical stakeholders is provided in Table 3-1 with an indication of whether they are also members of NITTEC or WNYIMT. Table 3-1 also lists which stakeholders returned an ITS survey and were interviewed to answer follow-up questions, as well as whether a representative attended the June 20 User Services Workshop.



Table 3-1 ITS Critical Stakeholders
Buffalo/Niagara Falls Region

Agency / Organization	Survey	Follow-Up Interview	User Services Workshop	NITTEC	WNYIMT
Federal Highway Administration	x	x	x	x	x
New York State Department of Transportation	x	x	x	x	x
New York State Thruway Authority	x	x	x	x	x
Niagara Frontier Transportation Authority	x	x	x	x	x
Ministry of Transportation, Ontario	x	x	x	x	
Niagara County	x		x	x	x
Erie County	x	x	Police	x	x
Niagara Falls, Ontario	x			x	
City of Buffalo	x	x	Police	x	Police
Niagara Frontier Transportation Committee	x		x		x
Niagara Falls Bridge Commission	x	x	x	x	
Buffalo & Fort Erie Public Bridge Authority	x	x	x	x	
New York State Police Department	x		x		x
Greater Buffalo Partnership	x				
Automobile Association of America (Western and Central NY)	x		x		x
Tower Group International (CJ Tower, Inc.)	x				
Region of Niagara, Ontario				x	
Metro Networks		x			x
US Customs/Immigration & Naturalization Service					

The Tower Group International and its local entity, CJ Tower, Incorporated is the primary customs brokerage firm for the regional international border crossings. Their mission is to expedite movement of goods through customs procedures into and out of the U.S. along the Canadian border. Thus it is important that the Tower representatives and U.S. Customs/Immigration and Naturalization Service be included in this project as critical stakeholders, to help address border



congestion and delays. The NFTC coordinates planning for regional transportation and has similarly been identified as a critical stakeholder.



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4.0 IDENTIFICATION OF USER SERVICES

4.1 NATIONAL USER SERVICES

To ensure that ITS programs developed for a region or locality have been developed to address specific user needs, the FHWA has identified seven groups of 29 User Services in the ITS National Program Plan (NPP), dated March 1995. The categorization of user services by group is shown in the Table 4-1. Where services developed by FHWA do not address the problems presented above, additional user services specific to the region or locality typically are developed.

4.2 GOALS AND OBJECTIVES

To identify the overall direction required for addressing transportation problems in the Buffalo/Niagara Falls area through ITS technologies, the first step is development of goals and objectives. The goals and objectives developed for each problem are presented in Table 3 (Appendix A), as revised at the June 20 User Services Workshop.

4.3 POTENTIAL USER SERVICES

The NPP user services and several new user services have been mapped to the goals and objectives for the region, as shown in Table 4 (Appendix A)

Twenty four of the NPP user services, along with five new user services developed specifically for the Buffalo / Niagara Falls area, have been identified as potential user services for the region. Each of the user services provides the region with a tool to achieve the goals and objectives identified in Table 3 (Appendix A). As shown in Table 4 (Appendix A), more than one user service can help to achieve each objective. This table has been refined based on input provided at the User Services Workshop.

**Table 4-1 ITS National Program Plan User Service Groups**

Group	User Service
1. Travel and Transportation Management	<ol style="list-style-type: none">1. En-Route Driver Information2. Route Guidance3. Traveler Services Information4. Traffic Control5. Incident Management6. Emissions Testing & Mitigation
2. Travel Demand Management	<ol style="list-style-type: none">1. Demand Management Operations2. Pre-Trip Travel Information3. Ride Matching and Reservation
3. Public Transportation Operations	<ol style="list-style-type: none">1. Public Transportation Management2. En-Route Transit Information3. Personalized Public Transit4. Public Travel Security
4. Electronic Payment	<ol style="list-style-type: none">1. Electronic Payment Systems
5. Commercial Vehicle Operations	<ol style="list-style-type: none">1. Commercial Vehicle Electronic Clearance2. Automated Roadside Safety Inspection3. On-Board Safety Monitoring4. Commercial Vehicle Administrative Processes5. Hazardous Materials Incident Response6. Freight Mobility
6. Emergency Management	<ol style="list-style-type: none">1. Emergency Notification and Personal Security2. Emergency Vehicle Management
7. Advanced Vehicle Control and Safety Systems	<ol style="list-style-type: none">1. Longitudinal Collision Avoidance2. Lateral Collision Avoidance3. Intersection Collision Avoidance4. Vision Enhancement for Crash Avoidance5. Safety Readiness6. Pre-Crash Restraint Deployment7. Automated Highway System

Reference: National ITS Program Plan, Volume 1.



5.0 USER SERVICES PLAN

5.1 USER SERVICE PRIORITY ASSESSMENT

Workshop attendees assessed the recommended user services in terms of relative importance as well as recommended time frame for implementation. Table 5 (Appendix A) lists each user service, what goals the user service satisfies and an implementation time frame and ranking. A time frame and ranking were provided by each workshop attendee for each user service. A tally was made of all attendee responses and a weighted average was computed. The weighted average of user services was developed as follows: weights were relative, ranging from a high of 25 points for short term, high priority to a low of 1 point for a long term, low priority.

The following list provides a summary of user services ranked in descending order according to weighted averages, which are shown in parenthesis.

Immediate Term

1. Traffic Control (22.26)
2. Electronic Payment Service (21.35)
3. Incident Management (21.35)
4. Interorganizational / International Management and Coordination* (21.1)
5. Commercial Vehicle Electronic Clearance (20.9)
6. Customs and Immigration Inspection and Clearance* (20.2)
7. Financial Management* (19.5)
8. Hazardous Materials Incident Response (19.39)
9. Road / Weather Information Service* (19.39)
10. Commercial Vehicle Administrative Processes (18.7)
11. Operations Management * (18.5)
12. En-route Driver Information (18.48)
13. Commercial Fleet Management (Freight Mobility) (18.4)
14. Emergency Vehicle Management (18.2)

Medium Term

15. Emergency Notification and Personal Security (16.7)
16. Public Travel Security (16.3)
17. Pre-Trip Travel Information (15.9)
18. Route Guidance (14.83)
19. Traveler Services Information (14.82)
20. En-route Transit Information (14.4)
21. Public Transportation Management (14.0)
22. Safety Readiness** (12.8)

Future Term

23. Railroad Crossing Protection (12.3)
24. Pre-Crash Restraint Deployment ** (12.2)



25. On-Board Safety Monitoring (12.05)
26. Intersection Collision Avoidance** (12.0)
27. Emissions Testing and Mitigation (11.9)
28. Automated Roadside Safety Inspection (11.7)
29. Vision Enhancement for Crash Avoidance** (11.5)
30. Automated Highway Systems** (10.7)
31. Lateral Collision Avoidance** (9.96)
32. Longitudinal Collision Avoidance** (9.96)
33. Ride Matching & Reservations (9.86)
34. Personalized Public Transit (8.2)

* New Buffalo Area Specific User Service

** User Service most probably will be implemented by others. Public agency interaction will be required.

User services with relative weights above the 70th percentile were identified as Immediate Term services, while those between the 50th and 70th percentiles were identified as Medium Term services. All other user services were identified as future term services. User services with equal relative weights were ranked according to the number of votes received in the identified term.

For each user service discussed below, the overall goals and detailed objectives met are presented in Table 6(Appendix A)

5.1.1 Immediate Term Services (Early Action)

The following user services, recommended for immediate implementation, are summarized in descending order.

5.1.1.1 Traffic Control

This service is included in the Travel and Transportation Management user service group. This user service manages the movement of traffic on streets and highways. Traffic Control includes surface street controls such as coordinated traffic signals as well as freeway techniques such as freeway entrance regulation (ramp metering) and priority for multiple-occupancy vehicles. This service is significant as it provides the basic framework which many of the other User Services depend upon, including volumes, occupancies and a communications infrastructure. Data collected here can be tied into Pre-Trip Travel Information and En-Route Driver Information user services.

This user service facilitates the following goals:

- Manage and Reduce Congestion
- Minimize Adverse Weather Effects on Travel
- Increase Processing Efficiency (at border crossings) and
- Facilitate Traveler Mobility (resident and visitor).



Existing and proposed signal coordination projects can be a base for implementation of this user service.

5.1.1.2 Electronic Payment Services

This service is included in the Electronic Payment user service group. This user service allows travelers to pay for transportation services electronically via automated collection systems. Enforcement of these systems is also automated. Electronic Toll Collection allows drivers to pay tolls without stopping at equipped toll plazas, to decrease delays and improve system efficiency.

This user service can be used to facilitate two goals:

- Manage Congestion and
- Increase Processing Efficiency (at border crossings).

Current Buffalo-Niagara area examples include the New York State Thruway Authority's E-Z Pass system.

5.1.1.3 Incident Management

This service is included in the Travel and Transportation Management user service group. This user service enhances existing capabilities for detecting incidents and improves incident response. Incident Management includes techniques such as remote incident detection, notification and response, as well as motorist assistance and obstruction removal.

The Incident Management user service, as shown in Table 6 (Appendix A), can facilitate the following goals:

- Manage and Reduce Congestion and
- Improve Safety.

5.1.1.4 Interorganizational / International Management and Coordination

This Buffalo area specific user service can be used to Increase Processing Efficiency (at border crossings), and can help facilitate the goal of Cooperative Spirit/Elevate Interorganizational Interaction. By increasing coordination among various transit service providers this service can also help facilitate the goal of Increase Transit Usage, and Interorganizational/International Management and Coordination can also be used to achieve the goals of Leverage Financial Resources and Enhance Productivity and Performance of Services and People. By protecting proprietary data and safeguarding individual liberties, Interorganizational/International Management and Coordination can be used for the goal of Maintain Privacy when data is shared between agencies, and can also contribute to the goal of Inform / Educate the Public.

Candidate actions include public relations programs. Goals met include:



- Increase Processing Efficiency (at Border Crossings)
- Ensure Cooperative Spirit/Elevate Interorganizational Interaction
- Increase Transit Usage
- Leverage Financial Resources
- Enhance Productivity and Performance (Services and People)
- Maintain Privacy
- Inform/Educate the Public.

Since this user service facilitates the achievement of so many area goals, it is important that its implementation be coordinated among all agencies.

5.1.1.5 Commercial Vehicle Electronic Clearance

This service is included in the Commercial Vehicle Operations user service group. This user service allows enforcement personnel to electronically check safety, credential, and size and weight data for equipped vehicles before they reach an inspection site in order to only select illegal or potentially unsafe vehicles for close inspection. Commercial Vehicle Electronic Clearance allows commercial trucks to pass international border checkpoints without stopping, or at least with expedited checks.

Commercial Vehicle Electronic Clearance helps facilitate the following goal:

- Increase Processing Efficiency (at Border Crossings).

5.1.1.6 Customs/Immigration Inspection and Clearance

This Buffalo area specific user service is important to the area to improve border crossing efficiency. The objective is to expedite on-site credential checking by creating a more efficient process, utilizing off-site preprocessing, automated inspection techniques, automated lane sorting and an up-to-date/fast database for implementing records checks for the full audience of vehicles crossing the border. As well, this user service will provide border crossing information to prepare travelers to have the correct documentation.

The goal facilitated by this user service is:

- Increase Processing Efficiency (at Border Crossings).

5.1.1.7 Financial Management

Financial Management, a Buffalo area specific user service, can be used to identify funding mechanisms, secure non-traditional financial partners, investigate opportunities to create cost efficiencies and promote cost sharing. Candidate actions include legislative changes, public/private partnerships and interorganizational memoranda of agreement and understanding.



Financial Management helps facilitates the following goal:

- Leverage Financial Resources.

5.1.1.8 Hazardous Materials Incident Response

This service is included in the Commercial Vehicle Operations user service group. The service provides emergency personnel at the scene of a hazardous materials incident immediate information on the types and quantities of hazardous materials present. This information will facilitate an efficient and appropriate response to the incident.

Implementation of the Hazardous Materials Incident Response user service facilitates the following goal:

- Improve Safety.

5.1.1.9 Road / Weather Information Service

This Buffalo area specific user service provides status information on pavement and visibility conditions, such that the proper information could be tied into the Pre-Trip Travel Information and En-Route Driver Information User Services.

Implementation of the Road / Weather Information Service, as shown in Table 6 (Appendix A), contributes to the following goal:

- Minimize Adverse Weather Effects on Travel.

5.1.1.10 Commercial Vehicle Administrative Processes

This service is included in the Commercial Vehicle Operations user service group. This user service allows carriers to purchase credentials and to collect and report fuel and mileage tax information electronically, yielding a significant reduction in the paperwork burden for motor carriers and regulatory agencies. It can be implemented with Commercial Vehicle Electronic Clearance and Interorganizational/International Management and Coordination to expedite commercial vehicles at border crossings.

Implementation facilitates the following goals:

- Increase Processing Efficiency (at Border Crossings)

The Commercial Vehicle Administrative Processes accomplishes the following objectives:

- Eliminate unnecessary processes; and
- Coordinate functions/processes between sites.



5.1.1.11 Operations Management

This Buffalo area specific user service can help manage a regionwide transportation system. Candidate actions include the integration of information systems, primarily for the benefit of system operators. Such systems might cover weather conditions and physical environment, system conditions and equipment locations, hazards, pavement management systems and GIS databases to help operate and maintain the regional transportation system. Also included in the user service could be interagency agreements to facilitate efficient operation, and education and training of agency staff.

The developing regional traffic operations center will help in the implementation of this user service.

The Operations Management user service can achieve the following goals.

- Enhance Productivity and Performance (Services and People).

5.1.1.12 En-Route Driver Information

This service is included in the Travel and Transportation Management user service group, and provides the driver en-route information on traffic conditions, incidents, construction and transit schedules. Transmission media can include VMS, HAR, public radio, and in-vehicle devices.

Implementation of En-route Driver Information facilitates the following goals:

- Manage and Reduce Congestion
- Minimize Adverse Weather Effects on Travel
- Improve Safety
- Facilitate Traveler Mobility (Residents and Visitors).

Current Buffalo area highway advisory radio (HAR) and variable message signs (VMS) can be used to help implement the En-route Driver Information User Service.

5.1.1.13 Commercial Fleet Management (Freight Mobility)

This service is included in the Commercial Vehicle Operations user service group. The service provides communications between drivers, dispatchers and intermodal transportation providers to help drivers avoid congested areas, and improve the reliability and efficiency of pickups and deliveries. Candidate actions include automatic vehicle location and monitoring, and off-peak delivery scheduling.

Implementation of this service facilitates the following goal:

- Manage and Reduce Congestion.



5.1.1.14 Emergency Vehicle Management

This service, included in the Emergency Management user service group, reduces the time for emergency vehicles to arrive on the scene through the use of system-wide fleet management, route guidance and signal prioritization.

Implementation of this User Service accomplishes the following goals:

- Minimize Adverse Weather Effects on Travel and
- Improve Safety.

5.1.2 Medium Term Services

The following user services, recommended for medium term implementation, are summarized in descending order.

5.1.2.1 Emergency Notification and Personal Security

This service in the Emergency Management user service group reduces the time from occurrence of an emergency or non-emergency incident until the notification of the appropriate response personnel. The location of the vehicle can be determined with GPS technology. Notification can be initiated manually or automatically in instances where serious injury prohibits the driver from performing manual notification.

Implementation facilitates the following goal:

- Improve Safety.

5.1.2.2 Public Travel Security

This service is included in the Public Transit Operations user service group, providing a secure environment for public transportation users and operators. Systems that monitor the environment of stations, stops and transit vehicles are used to provide security.

Implementation of this service accomplishes the following goals:

- Increase Transit Usage.

5.1.2.3 Pre-Trip Travel Information

This service in the Travel Demand Management user service group provides potential travelers access to a wide range of real-time intermodal transportation information at home, work or other facility where trips originate. This includes information on alternate travel modes, alternate routes



and travel period usage. Based on this information, travelers can select the departure time, route, and mode of travel which most efficiently transports them to their destination.

Pre-Trip Travel Information can be used to facilitate the following goals:

- Manage and Reduce Congestion,
- Minimize Adverse Weather Effects on Travel, and
- Facilitate Traveler Mobility (Residents and Visitors).

5.1.2.4 Route Guidance

This service is included in the Travel and Transportation Management user service group, providing travelers with a suggested route to reach a specified destination. This route can be specified from static information, such as the road network or transit schedules, or from real-time information about travel conditions.

Implementation of this User Service facilitates the following goals:

- Manage and Reduce Congestion
- Facilitate Traveler Mobility (Residents and Visitors).

5.1.2.5 Traveler Services Information

This service in the Travel and Transportation Management user service group provides the traveler with access to information regarding a wide variety of travel-related services and facilities, such as lodging and amenity locations. This information is accessible to the traveler in the home, office, or at kiosks in public facilities.

Implementation helps achieve the following goal:

- Facilitate Traveler Mobility (Residents and Visitors).

5.1.2.6 En-Route Transit Information

This service is included in the Public Transit Operations user service group to provide information to travelers using public transportation after they begin their trips. This real-time, accurate transit service route and schedule information could be available on-board the transit vehicles as well as at transit stations and stops. Transit travelers could use this information to make informed decisions while a trip is underway.

Implementation of this User Service accomplishes the following goals:

- Increase Transit Usage and
- Facilitate Traveler Mobility (Residents and Visitors).



5.1.2.7 Public Transportation Management

This service is included in the Public Transit Operations user service group. This service automates some of the operations, planning and management functions of public transit systems by providing real-time computer monitoring and analysis of transit vehicles and facilities. Techniques that include prioritization for transit vehicles at signalized intersections, pre-emption/bypass facilities and exclusive transit facilities then are used to improve the overall service of the transit system. Transit operations for special event/destination traffic can be improved.

Implementation of the Public Transportation Management User Service accomplishes the following goals:

- Manage and Reduce Congestion,
- Increase Transit Usage, and
- Facilitate Traveler Mobility (Residents and Visitors).

5.1.2.8 Safety Readiness

This service is included in the Advanced Vehicle Control and Safety Systems user service group, providing equipment to monitor driver, vehicle and infrastructure conditions, and sending a warning to the driver if needed. Sensors or manual input can come from inside the vehicle or from outside sources. The On-Board Safety Monitoring user service is closely related.

As shown in Table 6 (Appendix A), implementation of the Safety Readiness user service facilitates the following goal:

- Improve Safety.

5.1.3 Future Services

The following user services, recommended for future implementation, are summarized in descending order.

5.1.3.1 Railroad Crossing Protection

This service is included in the Advanced Vehicle Control and Safety Systems user service group. The service warns drivers of imminent collisions when approaching or crossing an at-grade railroad crossing, thus helping to prevent collisions at the crossing.

5.1.3.2 Pre-Crash Restraint Deployment

This service is included in the Advanced Vehicle Control and Safety Systems user service group. The Pre-Crash Restraint Deployment user service provides a means to anticipate an imminent collision and to activate passenger safety systems prior to actual impact, or much earlier in the crash



event than is currently feasible. Active responses include the tightening of lap-shoulder belts, arming and deploying air bags, and deploying roll bars.

This user service facilitates the following goal:

- Improve Safety.

5.1.3.3 On-Board Safety Monitoring

This service is included in the Advanced Vehicle Control and Safety Systems user service group. This user service senses the safety status of a commercial vehicle, cargo, and driver at mainline speeds and makes provisions for reporting this status to the driver and to sources external to the vehicle. The service expands the Safety Readiness user service by adding the status reporting to outside entities, such as commercial vehicle electronic clearance stations.

5.1.3.4 Intersection Collision Avoidance

This service is included in the Advanced Vehicle Control and Safety Systems user service group to warn drivers of imminent collisions when approaching or crossing an intersection. As shown in Table 6, this service facilitates the following goals:

- Minimize Adverse Effects on Travel and
- Improve Safety.

5.1.3.5 Emissions Testing and Mitigation

This service is included in the Travel and Transportation Management user service group, providing information for monitoring air quality and developing air quality improvement strategies. Advanced vehicle emissions testing systems provide information to identify areas in need of improvement. This service also provides transportation agencies with information that can be used to evaluate pollution control strategies.

5.1.3.6 Automated Roadside Safety Inspection

This service in the Commercial Vehicle Operations user service group allows for real-time, roadside access to the safety performance record of carriers, vehicles and drivers by enforcement personnel. This access helps to determine which vehicle should be stopped for an inspection and automates as many items as possible of the manual inspection process, in order to improve process efficiency.

5.1.3.7 Vision Enhancement for Crash Avoidance

This service is included in the Advanced Vehicle Control and Safety Systems user service group, utilizing in-vehicle equipment to improve the driver's ability to see the roadway and objects that are



on or along the roadway. Improved visibility will allow drivers to avoid potential collisions with other vehicles or obstacles. This user service helps achieve the following goals:

- Minimize Adverse Weather Effects on Travel and
- Improve Safety.

5.1.3.8 Automated Highway Systems

This service included in the Advanced Vehicle Control and Safety Systems user service group involves fully automated vehicle control to provide for a nearly accident free driving environment. Automated Highway Systems are considered in the long term deployment time frame for ITS. Automated Highway Systems facilitate the following goals:

- Minimize Adverse Weather Effects on Travel and
- Improve Safety.

5.1.3.9 Lateral Collision Avoidance

This service, included in the Advanced Vehicle Control and Safety Systems user service group, also provides crash warnings and controls for lane changes and road departures. Sensors continuously monitor a driver's blind spot when changing lanes and warns of an impending collision. Warning systems can also alert the driver of an impending road departure and provide help in keeping the vehicle in the lane. This user service helps to achieve the following goals:

- Minimize Adverse Weather Effects on Travel and
- Improve Safety.

5.1.3.10 Longitudinal Collision Avoidance

Also in the Advanced Vehicle Control and Safety Systems user service group, this user service helps the driver to prevent head-on, rear-end or backing collisions with other vehicles, objects or pedestrians. It includes the sensing of potential collisions, promoting avoidance actions, and temporarily controlling the vehicle. This user service helps to achieve the following goals:

- Minimize Adverse Weather Effects on Travel and
- Improve Safety.

5.1.3.11 Ride Matching and Reservations

This service in the Travel Demand Management user service group provides real-time ride matching information and reservations to users, and assists transportation providers with vehicle assignments and scheduling. This user service makes ride sharing easier and more convenient, and expands the market for an alternative to single occupant automobile travel.



5.1.3.12 Personalized Public Transit

This service is included in the Public Transit Operations user service group. It utilizes small publicly or privately operated vehicles to provide on-demand routing to pick up passengers requesting service to deliver them to their destinations. This service can expand transit coverage to lesser populated locations and potentially provide transportation at a lower cost and greater convenience than fixed route transit. This user service helps to achieve the following goal:

- Facilitate Traveler Mobility (Residents and Visitors).

5.2 PERFORMANCE CRITERIA

It is important that the ITS industry as a whole provide comprehensive system performance monitoring as a part of each deployment measure. ITS measures must be cost accountable in order to sustain continued support and investment on the part of program stakeholders.

Some ITS features return benefits which are well demonstrated and easily quantifiable. For example, a number of toll road authorities throughout the U.S. have documented operational cost savings and improved throughput/revenues attributed to electronic toll collection. Other ITS features, such as reduced motorist delay due to incident management, are more difficult to quantify in monetary terms.

In order to help expedite the demonstration and quantification of benefits from ITS features, the user services planning approach incorporates the establishment of performance criteria. Table 7 in Appendix A assigns performance Measures of Effectiveness (MOE) for each of the candidate user service objectives. Each MOE is characterized by a monitoring approach.

It is intended that ITS deployment market packages for the Buffalo/Niagara Falls area be developed in consideration of the performance criteria and associated monitoring approach. To the greatest extent possible, system processing should include automated monitoring, record keeping analysis, and reporting for the parameters as identified. Program administrators can use these performance monitoring features to track system benefits as a function of the ITS features introduced. Table 7 (Appendix A) illustrates that there are a number of monitoring parameters which address the performance criteria for multiple goals/objectives. High priority monitoring functions include:

- collection and storage of network volume and speed data from which several measures are derived;
- monitoring of incident response times/logs;
- review of accident data;
- monitoring of transit system schedule adherence;
- transportation infrastructure operations costs.

A key challenge in demonstrating system performance is the assembly of "before" data for purposes of comparison after ITS features are operational. To the greatest extent possible, existing automated monitoring features, such as permanent count station and accident databases should be used to



assemble a "before" data set. The experience in integrating large scale ITS deployment in other areas such as Long Island, Toronto, and San Antonio suggests that there is an opportunity to use system components to collect "before" data during the system integration process, before formal operations commence. This opportunity lasts three to nine months while various field subsystems are being tested, calibrated, and integrated to function as a complete system. The ITS program management process for Buffalo/Niagara Falls should emphasize a structured approach to collecting before data, as part of the system integration process.

5.3 POTENTIAL IMPLEMENTATION STRATEGIES FOR USER SERVICES

Candidate actions to implement each of the following user services are presented in Table 6. The listed actions are general at this point with no identified locations for application, and they will evolve to more defined technologies and specific project areas.

5.3.1 Immediate Term Implementation (Early Action)

5.3.1.1 Electronic Payment Services

The existing systems include the Peace Bridge automated toll collection swipe card technology, the New York State Thruway Authority's EZ-Pass System and the Niagara Falls Transportation Commission smart card transit fare collection. Electronic payment systems could incorporate existing systems into one comprehensive system to facilitate traveler mobility and increase transit usage. The Interorganizational/International Management and Coordination user service is a prime component for implementing this user service.

5.3.1.2 Traffic Control

Creation of a region wide traffic operations center is key to the implementation of regional traffic management. The existing and proposed interconnected traffic signal control systems throughout the region can be incorporated and NYSDOT's existing traffic count stations can be upgraded to provide real time input. Interorganizational/International Management and Coordination is a key supporting user service.

5.3.1.3 Incident Management

The first step in the implementation of Incident Management is to establish a formal incident detection system. Taking the existing manual identification of incidents one step further, a schedule could be established for roving emergency vehicles to decrease the detection time. Emergency vehicle locations could be used as basic input to the dispatch system. Eventually, an automated detection and dispatch system could be implemented. Existing traffic count stations may be upgraded to provide data input to an incident detection algorithm for automatic detection. The regional transportation operations center is a key component to the implementation of this user service.



5.3.1.4 Interorganizational / International Management and Coordination

The existing NITTEC forum could be expanded to facilitate this user service. A subcommittee of NITTEC could create press releases, while advertising campaigns and public education on the use of ITS technologies are potential implementation strategies. Organizational restructuring, transportation policy creation and agreements between agencies are example activities.

5.3.1.5 Commercial Vehicle Electronic Clearance

The Peace Bridge Authority could expand upon its automated toll collection. Commercial Vehicle Electronic Clearance could be incorporated with the Customs and Immigration Inspection and Clearance user service to expedite cross-border movements.

5.3.1.6 Customs and Immigration Inspection and Clearance

This user service would require a comprehensive information and surveillance system. Customs and Immigration Inspection and Clearance could be implemented within a remote activity / cargo area, then secure passes could be developed to facilitate pre-clearance.

5.3.1.7 Financial Management

This user service could be implemented as public / private partnerships for the development of other user services. The user service would necessitate legislative changes and possibly new working agreements between organizations. The Interorganizational / International Management and Coordination user service should be jointly developed with this user service.

5.3.1.8 Hazardous Material Incident Response

This user service could be implemented with the Commercial Vehicle Administrative Processes and the Customs / Immigration and Clearance user services to allow tracking of hazardous materials. The data collected here can also be utilized by the Incident Management user service to facilitate a more prepared response to a spill. The Regional Operations Center might be used to facilitate the data exchanges necessary among these user services. The Interorganizational/International Management and Cooperation user service, in addition, could facilitate compliance.

5.3.1.9 Road/Weather Information Service

The implementation of the Road / Weather Information user service involves installation of a system of data collection stations and an information dissemination network. New traffic count stations plus specialized weather monitor stations would provide the needed data collection. The Skyway Closing System, existing variable message signs (VMS) and highway advisory radio (HAR) could all be used for the information dissemination network.



5.3.1.10 Commercial Vehicle Administrative Processes

This user service, along with Customs / Immigration and Clearance, would necessitate a buy-in by the commercial vehicles that use the Buffalo area transportation system. The regulatory agencies involved must first establish the data requirements to eliminate/minimize paperwork. Regular monitoring of the system must be built in.

5.3.1.11 Operations Management

This user service can be implemented by creating integrated information management of a variety of traffic and physical facility systems. The service could also incorporate education and training of operations personnel, and databases of services and personnel.

5.3.1.12 En-Route Driver Information

En-Route Driver Information, the provision of travel data to the driver, requires a data collection network and an information dissemination network. The creation of a Regional Operations Center is key to creating a data collection network of travel conditions. The various existing traffic signal interconnect projects throughout the region as well as the existing traffic count stations could be used as a base for the data collection network. Developing systems of VMS and HAR as well as the Skyway Closing system, could be used to disseminate the collected information.

5.3.1.13 Commercial Fleet Management (Freight Mobility)

Commercial Fleet Management will incorporate automatic vehicle location and monitoring to create optimal delivery schedules for commercial vehicles. This user service should be coordinated with the Commercial Vehicle Administrative Processes user service.

5.3.1.14 Emergency Vehicle Management

This user service, along with Incident Management and Road / Weather Information Service, would need to be incorporated into the regional transportation operations center. Interorganizational/International Management and Coordination could be used to facilitate sharing of information among emergency service providers.

5.3.2 Medium Term Implementation

5.3.2.1 Emergency Notification and Personal Security

Emergency Notification and Personal Security would create a surveillance and notification system for travelers. In the Buffalo area, this system could be incorporated into an in-vehicle sensing and warning system similar to a mayday system. Calspan SRL Corporation is currently working on an accident collision notification (ACN) system. In addition, systems such as RESCU are now



available as options on private vehicles. The RESCU system has been developed and marketed by the Ford Corporation.

5.3.2.2 Public Travel Security

This user service could be implemented on transit vehicles to provide station or on-board monitoring, surveillance and emergency call buttons for driver and passengers.

5.3.2.3 Pre-Trip Travel Information

Utilizing the system wide data collection system created for previous user services, candidate actions for this user service could be to provide information on alternate travel modes, alternate routes, and travel period usage as well as information on weather / roadway surface conditions.

5.3.2.4 Route Guidance

This user service would provide in-vehicle navigation. There are several commercial models available from the various auto manufacturers and more are being developed all the time.

5.3.2.5 Traveler Services Information

With the high quality tourist attractions in the area, this user service could be used to provide information on attractions/destinations and would involve private sector participation.

5.3.2.6 En-Route Transit Information

This user service is the data dissemination component of the Public Transportation Management user service. Secure, reliable methods to provide route and schedule information would require both external data collection and transmission as well as on-board displays to passengers.

5.3.2.7 Public Transportation Management

This user service could provide real-time computer monitoring and analysis of transit vehicles and facilities. The up-to-the-minute data could then be used to provide input into the Pre-Trip Travel Information user service as well as the En-Route Transit Information User Service. Candidate actions include Route/Schedule information and Pre-emption/bypass facilities as well as express service to special events or destinations.

5.3.2.8 Safety Readiness

Safety Readiness equipment could be installed in commercial or private vehicles. The private sector would need to be involved in the development and marketing of this user service, including state-of-the-art seat belts and air bags.



5.3.3 Future Implementation

Implementation of the majority of future user services will require coordination with private sector developers and manufacturers. The technologies that provide many future user services are too immature to cite implementation strategies at this time. The future user services should, however, be considered in the development of functional requirements and system architecture so as not to preclude their implementation at a later date.



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Appendix A

User Services Workshop:

- Workshop Minutes, with Attendance List**
- User Service Tables** (referenced in text)

SYNTHESIS OF USER SERVICES WORKSHOP**Thursday, June 20, 1996, 1-3 PM****INTELLIGENT TRANSPORTATION SYSTEMS (ITS) STUDY
BUFFALO and NIAGARA FALLS METROPOLITAN AREA**

Location: Buffalo and Fort Erie Public Bridge Authority (Peace Bridge)
Conference Room

Agenda: See attached.

Attendees: 31 in all; see attached attendance list.

Rod Sechrist, the NYSDOT Project Manager, opened the workshop by briefly summarizing the purpose and objectives and welcoming the attendees. Following self-introductions, Syd Bowcott, the De Leuw, Cather & Co. Project Manager, gave an overview of ITS, region traffic problems and existing ITS features, using overheads (copies attached). Also included was a summary of the seven national ITS User Service Groups (or "bundles").

Barbara Schroeder, also of De Leuw, Cather & Co., next led the attendees through a series of working tables (copies attached) that: categorized regional problems/needs (Table 1); requested attendees' priorities for them (Table 2); laid out User Service goals and objectives to address the problems (Table 3); listed the corresponding User Services meeting the goals/objectives by User Service Group (Table 4); and, requested attendees to set priorities for the specific User Services (Table 5). For informational purposes, a preliminary candidate action list was distributed (Table 6). In proceeding through the tables, attendees provided input and feedback to update Tables 1, 3, 4 and 6. The updates are included in the attached versions.

The major result, in terms of input to regional ITS planning, is the priorities established by Tables 2 and 5. Overall, these two tables confirm and strengthen the results of previous surveys of area transportation system personnel and some representatives of the general public, as originally presented in Working Paper #1. In particular, workshop input to Table 2 (priorities on problems and needs) indicates:

- The most critical need overall is funding of transportation for both normal, day-in/day-out activities, as well as for ITS
- Congestion problems plus interorganizational relationships and cooperation rank as next in overall importance
- Following closely are border crossing issues, plus maintenance and operations concerns

- Intermediate level concerns relate to weather conditions, safety/incidents and recreational travel and tourism
- Transit services and privacy issues are viewed as longer range system concerns.

Table 5 dealing with preliminary priorities of specific User Services reflects many of the same concerns. Highly ranked User Services in the short-to-medium range include:

- Traffic Control, Incident Management, En-Route Driver Information and Road/Weather Information Services (Travel and Transportation Management User Services Group)
- Customs/Immigration Inspection and Clearance, Electronic Payment Services, Commercial Vehicle Electronic Clearance and Commercial Vehicle Administrative Processes, all related to border crossings, in particular (cuts across User Services Groups)
- Interorganizational Management and Coordination, Financial Management and Operations Management (Institutional Management User Services Group, the new Buffalo specific group, per Table 4).

In summary, this workshop provides base input to Working Paper #3, "User Objectives, Performance Criteria and User Services Plan." Attendees' input gives the basic direction needed to focus on specific strategies and projects that will maximize use of limited resources.

AGENDA

- I. Welcome Rod Sechrist
- II. Self-Introductions All
- III. Statement of Meeting Purpose Syd Bowcott
- IV. Introduction to ITS Syd Bowcott
 - A. What is ITS?
 - B. Time Frame
 - C. User Services
 - 1. Travel and Transportation Management
 - 2. Travel Demand Management
 - 3. Public Transportation Operations
 - 4. Electronic Payment
 - 5. Commercial Vehicle Operations
 - 6. Emergency Management
 - 7. Advanced Vehicle Control and Safety Systems
- V. Problems/Needs and Goals/Objectives Barbara Schroeder
 - A. Review Problems/Needs and Prioritize
 - B. Establish ITS Goals and Objectives
 - C. Select User Services and Prioritize
 - D. Candidate Actions
- VI. Closing Syd Bowcott
 - A. Next Steps

Meeting Sign In Sheet

Location: PEACE BRIDGE
 Date/Time: 6/20/96 @ 1:00 PM
 Subject: User Services Workshop

Name & Title	Organization	Phone
Keith Trous Engr.	DeLeuw, Cather	(716) 853-6940
Lauren Biny, Transportation Eng.	IBI Group	(416) 596-1930
Michael Johnson	A/E Group	716.854.1107
Barbara Schroeder	DeLeuw, Cather	(303) 863 7900
Ron Lammann	Peace Bridge	905 871-1608
ROD SECHRIST	NYS DOT	(716) 847-3669
MIKE FABIAN	NFTA	716 855-7288
Robert Ortiz	AAA WCNY	716 633-9860
ED STAROSIELEC	CALSPAN	716 631-6754
Joe Mozek	Town of Fort Erie	905 871-1600
Vicki Schillace	NFTA	(716) 855-7318
Edward Small	NFTA	716.856.2026
Pete Snyder	NYS DOT	518-457-1757
STEVEN ^{Lieutenant} CMOLETTI	NYS Police	518-457-3258
LARRY SMITH	ONTARIO MTD	416-235-5612
GEORGE WHITE	NYS THRUWAY AUTH	716-631-9017
DAVE YOUNG	PEACE BRIDGE	716-884-6744
Raymond Pacheco	Sierra Technologies	(716) 631-6680
GEORGE MOYER	" "	(716)-631-7771
JOE SLAZAK	AAA - WCNY	(716) 633-9860

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Buffalo ITS EOPS 6/20/96 User Service Working Group

<u>Name/Title</u>	<u>Agency/Organization</u>	<u>Telephone #</u>
JIM POWELL	DE LEUW, CATHER & CO.	312-930-5165
JOHN PROCTOR	MTU ONTARIO	905-704-2236
ROBERT SONDEL	NYSP	716-343-2200 EXT 332
FRANK E. BRODERICK	NY STATE POLICE	716-343-2200 x 3345
GARY W HORTON	ERIE Co SHERIFF'S OFFICE	716 662-6180
ALLEN GANDELL	NIAGARA FALLS P.R. CORP.	905-354-8641
JIM BARNACK	N.Y.S. D.O.T	716-847-3268
Tony Braunscheidel	Peace Bridge	716-884-6744
DORSON WILSON	NIAGARA Co. Highway	716-439-7760
Syd Bancroft	DeLew Cather	312-930-5147
LT. THOMAS MASTERSON	BUFFALO POLICE DEPT. TRAFFIC DIVISION	716-851-4828

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TABLE 1 CATEGORIZATION OF PROBLEMS/NEEDS	
PROBABLE CAUSES	PROBABLE EFFECTS
CONGESTION	
manual toll collection	toll booth delays
major activity center destinations	queuing at interchanges
increasing traffic volumes during peak hours limited rights-of-way insufficient travel way to meet peak demand high truck volumes travel way obstructions (stalls/accidents) inadequate signal coordination	stop/start flow delays deficient capacity poor levels of service
population/employment growth within/between eastern region of Western New York	increased trip-making
lack of active route diversion	queuing/congestion
lack of staffing for incident management, service patrols/police	response delays
disabled / parked cars	traffic delays
special events	queuing / congestion
WEATHER-RELATED CONDITIONS	
high winds and fog road surface snowpack/icing blowing/drifted snow	road closures (e.g., NY 5) accidents poor visibility travel way obstructions
heavy rains & floods / ice blockages	road closures
disabled, abandoned, parked cars	travel way obstructions
SAFETY/INCIDENTS	
substandard geometrics (merges/weaving in particular) driver inattention / poor behavior	accidents driver insecurity/hesitation

TABLE 1
CATEGORIZATION OF PROBLEMS/NEEDS

PROBABLE CAUSES	PROBABLE EFFECTS
vehicular breakdowns	personal insecurity travel way obstructions resulting in queuing/congestion
BORDER CROSSINGS	
capacity constraints inadequate plaza infrastructure and organization of facilities customs/immigration enforcement CVO credential checks toll collection processes	queuing/congestion delays
lack of staff	inefficiency in operations
inadequate signage/traffic channelization	confused/frustrated/lost travelers accidents
INTERORGANIZATIONAL/INTERNATIONAL COOPERATION	
overlap of roles/responsibilities	repetition of services provided (creates competition)
need for autonomy	who controls what
competing objectives between agencies (transportation vs. customs; between individual border crossing authorities)	lack of coordinated, system-wide plan contributes to current congestion problems because transportation is not managed lack of standardized systems/components
maintaining high interest level in NITTEC	as interest drops, cooperation/coordination between agencies becomes less
lack of time (staff) lack of understanding of other organization perspectives	less interest in ITS solutions; continuation of traditional responses/actions to transportation problems
limited knowledge of ITS	perception that ITS is ineffective and a waste of money
institutional barriers (audits)	secrecy inability to share resources

TABLE 1
CATEGORIZATION OF PROBLEMS/NEEDS

PROBABLE CAUSES	PROBABLE EFFECTS
lack of real time data collection capabilities	no information for existing infrastructure; inability to share data between organizations
TRANSIT SERVICES	
radial service patterns	lack of suburb-to-suburb service
traveler insecurity/perceived safety threat	reluctance to use transit
insufficient operating revenues	not enough routes/frequency
inadequate marketing/public relations	general public perceives that public transit agencies operate “for profit” and are poorly managed
inadequate routes/service frequency lack of traveler information: pre-trip, en-route; other transit services/other modes (e.g., park-n-ride, multi-modal facility availability)	limits ridership
FUNDING	
inadequate revenues for capital, operating, and maintenance expenses	inability to direct limited local dollars to ITS allocation of dollars solely to maintaining pavement surface conditions
legislative control of \$5M revolving fund	concern over if/how/where dollars being spent
lack of financial commitment to ITS	inability to implement new programs/ systems
inability to support (pay for) additional staff with appropriate expertise	lack of technical capability to develop/ operate/maintain advanced technology infrastructure
low priority of transportation in budgeting	inadequate funding
OPERATIONS AND MAINTENANCE	
planned construction activities	congestion; traffic diversion to other congested routes
roads in disrepair (pot holes cited most often)	public perceives patching is temporary, ineffective, and inefficient

TABLE 1 CATEGORIZATION OF PROBLEMS/NEEDS	
PROBABLE CAUSES	PROBABLE EFFECTS
snow /ice removal activity	road obstructions
RECREATIONAL TRAVEL/TOURISM	
new developments (particularly the casino)	more traffic/more congestion
inadequate directional/guidance signage	frustrated/lost travelers
lack of user knowledge to preplan for a border crossing trip (i.e. not equipped with proper passport and identification; not aware of toll requirements)	traveler confusion
PRIVACY	
1984 “Big Brother” syndrome	difficulty in collecting/disseminating travel time data
proprietary/confidential data remaining anonymous	reluctance to support certain ITS solutions
PUBLIC SUPPORT	
lack of knowledge of ITS benefits	reluctance to support pertinent ITS applications
staged deployment of ITS projects (i.e. VMS installed long before data is available for dissemination)	public perception that ITS applications are useless and wasting taxpayer dollars

TABLE 2
PROBLEM/NEED PRIORITIZATION

PROBLEM/NEED CATEGORY	NEAR TERM (0-5 YEARS)			MID TERM (5-10 YEARS)			LONG TERM (BEYOND 10 YEARS)		
	High	Med	Low	High	Med	Low	High	Med	Low
Congestion	10	5	1	3	2	1			
Weather-Related Conditions	4	7	3		4			1	3
Safety/Incidents	4	6	3	1	3	2			2
Border Crossings	7	8	2	1	3	1			
Interorganizational/ International Cooperation	9	8	3		1			1	
Transit Services	2		4	1	6	6			3
Funding	13	4	3	1					
Operations and Maintenance	6	7	2	3	3				
Recreational Travel/Tourism	4	5	5	1	4	3			
Privacy	2		5		7	5	2		1
Public Support	x								

Note: Number indicates number of respondents who prioritized a particular problem/need at that action level.

x = no data.

blank = zero respondents.

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TABLE 3
ITS USER SERVICE GOALS/OBJECTIVES

PROBLEM/NEED CATEGORY	GOAL(S)	OBJECTIVES
Congestion	<i>Manage and Reduce Congestion</i>	<ul style="list-style-type: none"> • Increase operational capacity • Reduce delays • Improve environmental/air quality • Manage peak period vehicle demand • Reduce unnecessary Vehicle Miles Traveled (VMT) • Manage peak “person” demand (i.e. increase individual vehicle occupancy) • Expedite toll collection • Better inform public on congestion/incidents • Manage/plan special event/destination traffic • Improve incident management
Weather-Related Conditions	<i>Minimize Adverse Weather Effects on Travel</i>	<ul style="list-style-type: none"> • Provide reliable road/weather information to travelers • Reduce accident frequency • Control known trouble locations • Effectively deploy maintenance/incident management/emergency equipment • Standardize travel messages, equipment/devices and policies

TABLE 3
ITS USER SERVICE GOALS/OBJECTIVES

PROBLEM/NEED CATEGORY	GOAL(S)	OBJECTIVES
Safety/Incidents	<i>Improve Safety</i>	<ul style="list-style-type: none"> • Reduce accident frequency • Reduce accident severity • Improve response/removal time to incidents • Increase personal <i>and</i> personnel security • Improve incident management reporting and information sharing • Inform public • Improve hazardous materials monitoring and incident response
Border Crossings	<i>Increase Processing Efficiency</i>	<ul style="list-style-type: none"> • Expedite on-site and off-site credential processing • Automate border crossing devices • Enhance collection handling • Eliminate unnecessary processes • Mitigate localized emissions pollution • Coordinate functions/ processes between sites • Provide adequate staff • Enhance risk assessment • Improve hazardous material monitoring and spill response

TABLE 3
ITS USER SERVICE GOALS/OBJECTIVES

PROBLEM/NEED CATEGORY	GOAL(S)	OBJECTIVES
Interorganizational / International Cooperation	<i>Ensure Cooperative Spirit</i> <i>Elevate Interorganizational/ International Interaction</i>	<ul style="list-style-type: none"> • Develop common goals/terminology • Coordinate plans/programs/activities/processes • Reduce overlap in roles/responsibilities/functions • Maintain autonomy • Promote/improve public agency image; better inform the public • Increase/maximize use of ITS knowledge • Resolve institutional barriers • Develop common terminology • Liberalize union work rules • Share resources • Establish an information exchange network
Transit Services	<i>Increase Transit Use</i>	<ul style="list-style-type: none"> • Enhance transit services • Improve schedule adherence • Provide “competitive” travel options • Reduce SOV use • Alter public perceptions through marketing strategies • Improve traveler security • Coordinate regional service providers: public and private • Improve multimodal access and information

TABLE 3
ITS USER SERVICE GOALS/OBJECTIVES

PROBLEM/NEED CATEGORY	GOAL(S)	OBJECTIVES
Funding	<i>Leverage Financial Resources</i>	<ul style="list-style-type: none"> • Identify funding mechanisms • Secure non-traditional financial partners • Investigate opportunities to create cost efficiencies (procurement, contracting) • Change enabling legislation as needed • Improve public / agency awareness of needs • Increase staffing for critical needs • Increase priority of transportation funding • Balance capital and operating expenditures • Improve labor agreements • Demonstrate economic benefit • Promote cost sharing
Operations and Maintenance	<i>Enhance Productivity and Performance (Services and People)</i>	<ul style="list-style-type: none"> • Maintain “drivable” roadway surfaces • Eliminate redundant functions • Cross-train existing staff • Reduce site-to-site travel (e.g., to monitor equipment) • Streamline work processes • Manage construction schedules • Promote resource sharing
Recreational Travel/Tourism	<i>Facilitate Traveler Mobility (Residents and Visitors)</i>	<ul style="list-style-type: none"> • Reduce unnecessary trip-making • Provide reliable/accurate travel information • Capture economic benefits • Provide border crossing information

TABLE 3 ITS USER SERVICE GOALS/OBJECTIVES		
PROBLEM/NEED CATEGORY	GOAL(S)	OBJECTIVES
Privacy	<i>Maintain Privacy</i>	<ul style="list-style-type: none">• Define/Protect proprietary data• Safeguard individual liberties
Public Support	<i>Inform / educate the public</i>	<ul style="list-style-type: none">• Use the media to promote a positive/proactive approach• Develop and implement marketing strategies

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TABLE 4
SELECTION OF USER SERVICES

PROBLEM/NEED CATEGORY	GOAL/OBJECTIVES	USER SERVICE(S)	USER SERVICE GROUP
Congestion	<i>Manage and Reduce Congestion</i>		
	Increase operational capacity	Traffic Control	TTM
	Reduce delays, fuel consumption	En-Route Driver Information	TTM
		Incident Management	
	Manage peak period vehicle demand Manage peak “person” demand	Pre-Trip Travel Information	TDM
		Commercial Fleet Management(Freight Mobility)	CVO
		Demand Management and Operations	TDM
	Reduce unnecessary vehicle miles traveled (VMT)	Route Guidance	TTM
	Expedite toll collection	Electronic Payment Services	EP
	Improve incident management	Incident Management	TTM
	Manage/plan special event/destination traffic	Pre-Trip Travel Information	TDM
		En-Route Driver Information	TTM
		Traffic Control	TTM
		Public Transportation Management	PTO
	Improve environmental/air quality	Emissions Testing & Mitigation	TTM
	Better inform public on congestion / incidents	En-Route Driver Information	TTM

¹New Buffalo area-specific User Service.

²User Service would be implemented by others; agency interaction required.

³IM=Institutional Management, a new Buffalo area-specific User Service Group.

TABLE 4
SELECTION OF USER SERVICES

PROBLEM/NEED CATEGORY	GOAL/OBJECTIVES	USER SERVICE(S)	USER SERVICE GROUP
Weather-Related Conditions	<i>Minimize Adverse Weather Effects on Travel</i>		
	Provide reliable road/weather information to travelers	Road/Weather Information Service¹	TTM
	Standardize travel messages; equipment/devices & policies		
	Reduce accident frequency	En-Route Driver Information	TTM
		Pre-trip Travel Information	TDM
		Collision Avoidance/Vision Enhancement/Automated Highway Systems ²	AVCSS
	Control known trouble locations	Traffic Control	TTM
	Effectively deploy maintenance/incident management/emergency equipment	Emergency Vehicle Management	EM
		Demand Management & Operations	TDM

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³IM=Institutional Management, a new Buffalo area-specific User Service Group.

TABLE 4
SELECTION OF USER SERVICES

PROBLEM/NEED CATEGORY	GOAL/OBJECTIVES	USER SERVICE(S)	USER SERVICE GROUP
Safety/Incidents	<i>Improve Safety</i>		
	Reduce accident frequency	En-Route Driver Information	TTM
		Collision Avoidance/Vision Enhancement/Automated Highway Systems ²	AVCSS
	Reduce accident severity	Emergency Notification and Personal Security	EM
		Safety Readiness ²	AVCSS
		Pre-Crash Restraint Deployment ²	
	Improve response/removal time to incidents	Incident Management	TTM
	Improve incident reporting & information sharing	Emergency Vehicle Management	EM
	Increase personal security & personnel security	Emergency Notification and Personal Security	EM
		Public Travel Security	
	Improve hazardous material monitoring and incident response	Commercial Fleet Management(Freight Mobility)	CVO
		Hazardous Materials Incident Response	CVO
	Inform public	Pre-Trip Travel Information	TDM
		En-Route Driver Information	TTM

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TABLE 4
SELECTION OF USER SERVICES

PROBLEM/NEED CATEGORY	GOAL/OBJECTIVES	USER SERVICE(S)	USER SERVICE GROUP
Border Crossings	<i>Increase Processing Efficiency (border crossings)</i>		
	Expedite on-site and off-site credential processing	<i>Customs/Immigration Inspection and Clearance</i> ¹	TTM
		Traffic Control	
		Emergency Notification and Personal Security	EM
		Commercial Vehicle Electronic Clearance	CVO
	Enhance collection handling	Electronic Payment Services	EP
	Automate border crossing devices	Commercial Vehicle Electronic Clearance	CVO
	Provide adequate staff	<i>Interorganizational/International Management and Coordination</i> ¹	IM ³
	Enhance Risk Assessment		
	Eliminate unnecessary processes	Demand Management and Operations	TDM
	Coordinate functions/processes between sites	Commercial Vehicle Administrative Processes	CVO
	Improve hazardous material monitoring and spill response	Hazardous Material Incident Response	CVO
	Mitigate localized emissions pollution	Emissions Testing & Mitigation	TTM

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TABLE 4
SELECTION OF USER SERVICES

PROBLEM/NEED CATEGORY	GOAL/OBJECTIVES	USER SERVICE(S)	USER SERVICE GROUP
Interorganizational/ International Cooperation	<i>Ensure Cooperative Spirit/Elevate Interorganizational/International Interaction</i>		
	Develop common goals/terminology	<i>Interorganizational/ International Management and Coordination</i> ¹	IM ³
	Coordinate plans/programs/ activities/processes		
	Reduce overlap in roles/ responsibilities/functions		
	Maintain autonomy		
	Promote/improve public agency image; better inform the public		
	Increase/maximize use of ITS capabilities		
	Resolve institutional barriers		
	Develop common terminology		
	Liberalize union work rules		
	Share resources		
	Establish an information exchange network		

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TABLE 4
SELECTION OF USER SERVICES

PROBLEM/NEED CATEGORY	GOAL/OBJECTIVES	USER SERVICE(S)	USER SERVICE GROUP
Transit Services	<i>Increase Transit Use</i>		
	Reduce SOV use	Public Transportation Management	PTO
	Provide “competitive” travel options	En-Route Transit Information	
	Improve multimodal access and information	Traffic Control	TTM
	Improve schedule adherence		
	Alter public perceptions Coordinate regional service providers: public and private Enhance traveler security	<i>Interorganizational/ International Management and Coordination</i> ¹	IM ³
	Enhance transit services		
	Improve traveler security	Public Travel Security	PTO

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TABLE 4
SELECTION OF USER SERVICES

PROBLEM/NEED CATEGORY	GOAL/OBJECTIVES	USER SERVICE(S)	USER SERVICE GROUP
Funding	<i>Leverage Financial Resources</i>		
	Identify funding mechanisms	<i>Financial Management</i> ¹	IM ³
	Secure non-traditional financial partners		
	Investigate opportunities to create cost efficiencies (procurement, contracting)		
	Increase priority of transportation funding		
	Balance capital and operating expenditures		
	Demonstrate economic benefit		
	Promote cost sharing	<i>Interorganizational/ International Management and Coordination</i> ¹	IM ³
	Change enabling legislation as needed		
	Improve public/agency awareness of needs		
	Increase staffing for critical needs		
	Improve labor agreements		

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TABLE 4
SELECTION OF USER SERVICES

PROBLEM/NEED CATEGORY	GOAL/OBJECTIVES	USER SERVICE(S)	USER SERVICE GROUP
Operations and Maintenance	<i>Enhance Productivity and Performance (Services and People)</i>		
	Maintain “drivable” roadway surfaces	<i>Operations Management</i> ¹	IM ³
	Eliminate redundant functions		
	Cross-train existing staff		
	Reduce site-to-site travel		
	Streamline work processes		
	Manage construction schedules		
	Promote resource sharing	<i>Interorganizational/ International Management and Coordination</i> ¹	IM ³

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TABLE 4
SELECTION OF USER SERVICES

PROBLEM/NEED CATEGORY	GOAL/OBJECTIVES	USER SERVICE(S)	USER SERVICE GROUP
Recreational Travel/Tourism	Facilitate Traveler Mobility (Residents and Visitors)		
	Reduce unnecessary trip-making	En-Route Driver Information	TTM
		Pre-Trip Travel Information	TDM
	Provide border crossing information	Route Guidance	
	Provide reliable/accurate travel information	En-Route Driver Information	TTM
		Pre-Trip Travel Information	TDM
		En-Route Transit Information	PTO
		Public Transportation Management	PTO
		Personalized Public Transit	PTO
	Capture economic benefits	Traveler Services Information	TTM
Privacy	Maintain Privacy		
	Define / protect proprietary data	Interorganizational/ International Management and Coordination ¹	IM ³
	Safeguard individual liberties		
Public Support	Inform / Educate the Public		
	Use the media to promote a positive / proactive approach	Interorganizational/ International Management and Coordination ¹	IM ³
	Develop and implement marketing strategies		

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TABLE 5
PRELIMINARY PRIORITIZATION OF USER SERVICES

User Service	Applicable Goal(s)	Priority by Time Frame									Weight (Rank)
		Near Term			Mid Term			Long Term			
		H 25	M 22	L 19	H 16	M 13	L 10	H 7	M 4	L 1	
Electronic Payment User Service Group											
Electronic Payment Services	<input type="checkbox"/> Manage and reduce congestion <input type="checkbox"/> Increase processing efficiency (border crossings)	9	8	2	1	2	1				21.35 (2)
Travel and Transportation Management User Service Group											
Traffic Control	<input type="checkbox"/> Manage and reduce congestion <input type="checkbox"/> Minimize adverse weather effects on travel <input type="checkbox"/> Increase processing efficiency (border crossings) <input type="checkbox"/> Manage/plan special event/destination traffic <input type="checkbox"/> Increase transit usage	12	7	1	1	1	1				22.26 (1)
Incident Management	<input type="checkbox"/> Manage and reduce congestion <input type="checkbox"/> Improve safety	9	8	2	1	2	1				21.3 (3)
Road/Weather Information Service ¹	<input type="checkbox"/> Minimize adverse weather effects on travel	3	9	5	3		3				19.39 (8)
En-Route Driver Information	<input type="checkbox"/> Manage and reduce congestion <input type="checkbox"/> Minimize adverse weather effects on travel <input type="checkbox"/> Improve safety <input type="checkbox"/> Facilitate traveler mobility (residents and visitors)	6	6	1	4	3	1	1	1		18.48 (12)
Route Guidance	<input type="checkbox"/> Manage and reduce congestion <input type="checkbox"/> Facilitate traveler mobility (residents and visitors)	2	4	3	3	5		3	3		14.83 (18)
Traveler Services Information	<input type="checkbox"/> Facilitate traveler mobility (residents and visitors)		7	1	1	7	4		1	2	14.82 (19)
Emissions Testing and Mitigation	<input type="checkbox"/> Manage and reduce congestion <input type="checkbox"/> Increase processing efficiency		3	1		9	5	1		3	11.9 (27)

¹New Buffalo area-specific User Service²User Service most probable to be implemented by others. Public agency interaction will be required.³For the User Services Workshop, the goals and objectives for this user service had been mistakenly listed as increase processing efficiency (border crossings). For this reason, it was ranked fairly high by the attendees.

TABLE 5
PRELIMINARY PRIORITIZATION OF USER SERVICES

USER SERVICE	APPLICABLE GOAL(S)	PRIORITY BY TIME FRAME									WEIGHT (RANK)
		NEAR TERM			MID TERM			LONG TERM			
		H 25	M 22	L 19	H 16	M 13	L 10	H 7	M 4	L 1	
Institutional Management User Service Group											
Interorganizational/ International Management and Coordination ¹	<input type="checkbox"/> Ensure cooperative spirit <input type="checkbox"/> Elevate interorganizational / international interaction <input type="checkbox"/> Increase transit use <input type="checkbox"/> Maintain privacy <input type="checkbox"/> Leverage financial resources <input type="checkbox"/> Enhance productivity and performance (services and people) <input type="checkbox"/> Inform/educate public: develop support <input type="checkbox"/> Increase processing efficiency (border crossings)	10	7	1	1	3		1			21.1 (4)
Customs/ Immigration Inspection and Clearance ¹	<input type="checkbox"/> Increase processing efficiency (border crossings)	10	3	3	3	2	1	1			20.2 (6)
Financial Management ¹	<input type="checkbox"/> Leverage financial resources	7	6	3	3		3	1			19.5 (7)
Operations Management ¹	<input type="checkbox"/> Enhance productivity and performance (services and people)	6	5	1	5	4	1		1		18.5 (11)
Commercial Vehicle Operations User Service Group											
Commercial Vehicle Electronic Clearance	<input type="checkbox"/> Increase processing efficiency (border crossings)	11	4	3	2	1	1		1		20.9 (5)
Hazardous Materials Incident Response	<input type="checkbox"/> Improve safety <input type="checkbox"/> Increase processing efficiency (border crossings)	5	7	7	1	1			1	1	19.39 (8)
Commercial Vehicle Administrative Processes	<input type="checkbox"/> Increase processing efficiency (border crossings)	8	5		3	3	3		1		18.7 (10)
Commercial Fleet Management	<input type="checkbox"/> Manage and reduce congestion <input type="checkbox"/> Improve safety	1	6	4	7	3	2				18.4 (13)
On-Board Safety Monitoring	<input type="checkbox"/> Improve Safety	2	1	1	3	5	2	2	3	2	12.05 (25)

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TABLE 5
PRELIMINARY PRIORITIZATION OF USER SERVICES

USER SERVICE	APPLICABLE GOAL(S)	PRIORITY BY TIME FRAME									WEIGHT (RANK)
		NEAR TERM			MID TERM			LONG TERM			
		H 25	M 22	L 19	H 16	M 13	L 10	H 7	M 4	L 1	
Automated Roadside Safety Inspection	<input type="checkbox"/> Improve Safety <input type="checkbox"/> Improve efficiency	2	2	1	3	6	2	2	3	2	11.7 (28)
<i>Emergency Management User Service Group</i>											
Emergency Vehicle Management	<input type="checkbox"/> Minimize adverse weather effects on travel <input type="checkbox"/> Improve safety	5	5	5		4	3	1			18.2 (14)
Emergency Notification and Personal Security	<input type="checkbox"/> Improve safety <input type="checkbox"/> Increase processing efficiency (border crossings)	3	5	5	3	1	3	1	1	1	16.7 (15)
<i>Public Transportation Operations User Service Group</i>											
Public Travel Security	<input type="checkbox"/> Increase transit use <input type="checkbox"/> Improve Safety	4	5	4	1	4	1	1		3	16.3 (16)
En-Route Transit Information	<input type="checkbox"/> Increase transit use <input type="checkbox"/> Facilitate traveler mobility (residents and visitors)	2	1	4	4	5	4	2		1	14.4 (20)
Public Transportation Management	<input type="checkbox"/> Increase transit use <input type="checkbox"/> Facilitate traveler mobility (residents and visitors) <input type="checkbox"/> Manage and reduce congestion	2	2	1	6	4	5		3		14.0 (21)
Personalized Public Transit	<input type="checkbox"/> Facilitate traveler mobility (residents and visitors)		2		1	4	4	3	2	7	8.2 (34)

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TABLE 5
PRELIMINARY PRIORITIZATION OF USER SERVICES

USER SERVICE	APPLICABLE GOAL(S)	PRIORITY BY TIME FRAME									WEIGHT (RANK)
		NEAR TERM			MID TERM			LONG TERM			
		H 25	M 22	L 19	H 16	M 13	L 10	H 7	M 4	L 1	
Travel Demand Management User Service Group											
Pre-Trip Travel Information	<input type="checkbox"/> Manage congestion <input type="checkbox"/> Minimize adverse weather effects on travel <input type="checkbox"/> Facilitate traveler mobility (residents and visitors)	1	4	6	2	4	3	1		1	15.9 (17)
Ride Matching and Reservation	<input type="checkbox"/> Reduce congestion		2		3	6	3		3	5	9.86 (33)
Demand Management and Operations	<input type="checkbox"/> Manage congestion <input type="checkbox"/> Increase processing efficiency (border crossings)	8	5	2	2	5	1				19.8 # ³
Advanced Vehicle Control and Safety Systems User Service Group											
Safety Readiness ²	<input type="checkbox"/> Improve safety	2	3	2		5	1	2	3	2	12.8 (22)
Railroad Crossing Protection	<input type="checkbox"/> Improve safety <input type="checkbox"/>	2	2	2	4	2	4		1	5	12.3 (23)
Pre-Crash Restraint Deployment ²	<input type="checkbox"/> Improve safety	2	3	1	1	5	1	1	4	3	12.2 (24)
Intersection Collision Avoidance ²	<input type="checkbox"/> Minimize Adverse Weather Effects on Travel <input type="checkbox"/> Improve Safety	2	3	1	3	4	2	2	2	4	12.0 (26)
Vision Enhancement for Crash Avoidance ²	<input type="checkbox"/> Minimize Adverse Weather Effects on Travel <input type="checkbox"/> Improve Safety		3	3	3	3	1	2	4	3	11.5 (29)
Automated Highway Systems ²	<input type="checkbox"/> Minimize Adverse Weather Effects on Travel <input type="checkbox"/> Improve Safety		2	6		3		3	6	3	10.7 (30)
Lateral Collision Avoidance ²	<input type="checkbox"/> Minimize Adverse Weather Effects on Travel <input type="checkbox"/> Improve Safety	1	3	2		3	3	3	1	7	9.96 (31)
Longitudinal Collision Avoidance ²	<input type="checkbox"/> Minimize Adverse Weather Effects on Travel <input type="checkbox"/> Improve Safety	1	2	2	1	4	3	2	1	7	9.96 (31)

¹New Buffalo area-specific User Service

²User Service most probable to be implemented by others. Public agency interaction will be required.

³For the User Services Workshop, the goals and objectives for this user service had been mistakenly listed as increase processing efficiency (border crossings). For this reason, it was ranked fairly high by the attendees.

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TABLE 6
PRELIMINARY CANDIDATE ACTION LIST

USER SERVICE	OBJECTIVE(S) MET	CANDIDATE ACTION(S)
Goal: Manage and Reduce Congestion		
En-Route Driver Information	Reduce delays Manage/plan special event/destination traffic Better inform public on congestion/incidents	VMS
		HAR
		In-vehicle devices
Route Guidance	Reduce unnecessary VMT	
Pre-Trip Travel Information	Reduce peak period vehicle demand Manage/plan special event/destination traffic Manage peak “person” demand	Information on alternate travel modes
		Information on alternate routes
		Information on travel period usage
Demand Management and Operations		Special use facilities
		Facility use restrictions
		Provide traffic control for events/destinations
Traffic Control	Manage/plan special event/destination traffic	Traffic signal coordination
		Freeway entrance regulation
		Multiple-occupancy vehicle priority
	Increase operational capacity	Remote system surveillance
		Preplanned traffic controls
Incident Management	Reduce delays Improve incident management	Remote incident detection
		Incident notification/response
		Obstruction removal
		Information on alternative routes
		Motorist assistance
		Service provider coordination
Electronic Payment Services	Expedite toll collection	Automated collection systems
		Remote surveillance and notification
		Special/restricted use facilities
		Credential pre-clearance
		Automated enforcement
Commercial Fleet Management (Freight Mobility)	Manage peak period vehicle demand Manage peak “person” demand	Automatic vehicle location and monitoring
		Adjust delivery schedules
Public Transportation Management	Manage/plan special event/destination traffic	Provide express service to special events or destinations
Goal: Minimize Adverse Weather Effects on Travel		

¹Buffalo Area-Specific User Service²By Others; Interface Required

TABLE 6
PRELIMINARY CANDIDATE ACTION LIST

USER SERVICE	OBJECTIVE(S) MET	CANDIDATE ACTION(S)
En-Route Driver Information	Reduce accident frequency	Information on weather/roadway surface conditions
Pre-Trip Travel Information		Environmental monitoring (roadside and on-vehicle sensors)
Collision Avoidance ²		Vehicle to roadside data transmission
Vision Enhancement ²		In-vehicle safety devices
Automated Highway Systems ²		
Traffic Control	Control known trouble locations	Automated road closure systems Preplanned traffic control strategies
Road/Weather Information Service ¹	Provide reliable road/weather information	Weather pattern/pavement condition identification/prediction/forecasting
Emergency Vehicle Management	Effectively deploy maintenance/incident management/emergency equipment	Surveillance and notification
Goal: Improve Safety		
En-Route Driver Information	Reduce accident frequency	Warnings of unsafe conditions/incidents
Collision Avoidance ²		Road condition forecasts/advisories
Vision Enhancement ²		Automated in-vehicle controls
Automated Highway Systems ²		
Emergency Notification and Personal Security	Reduce accident severity Increase personal security	Surveillance and notification In-vehicle sensing/warning systems
Safety Readiness ²		Automated in-vehicle protective devices
Pre-Crash Restraint Deployment ²		Automated vehicle location
Incident Management		Remote incident detection Automated emergency services dispatch
Emergency vehicle management	Improve response/removal time of incidents Improve reporting and sharing of information	
Hazardous Materials Incident Response	Improve hazardous materials monitoring and response	
Emergency Notification and Personal Security	Increase personal security	Mayday systems.
Goal: Increase Processing Efficiency (at Border Crossings)		

¹Buffalo Area-Specific User Service²By Others; Interface Required

TABLE 6
PRELIMINARY CANDIDATE ACTION LIST

USER SERVICE	OBJECTIVE(S) MET	CANDIDATE ACTION(S)
Traffic Control	Expedite on-site credential processing	Remote activity/cargo monitoring/enforcement
Customs/Immigration Inspection and Clearance ¹		Pass pre-clearance
Commercial Vehicle Electronic Clearance		Information systems integration
Interorganizational/ International Management and Coordination	Provide adequate staff Enhance risk assessment	Continue with NITTEC
Electronic Payment Services	Enhance collection handling Automate border crossing devices	Automated vehicle identification
		Electronic usage prepayment
		Install automated border crossing devices
Commercial Vehicle Administrative Processes	Eliminate unnecessary processes Coordinate functions/processes between sites	Information on alternate routes
Demand Management and Operations		One-stop shopping
		Electronic information sharing
Goal: <i>Ensure Cooperative Spirit/Elevate Interorganizational Interaction</i>		
Interagency Management and Coordination ¹	Develop common goals/terminology Coordinate plans/programs/activities/processes Reduce overlap in roles/responsibilities/functions Share resources	Organizational restructuring
		Policy setting
		Establish working groups
	Maintain autonomy	Policy setting
	Promote/improve public agency image	Business development/public relations programs
	Increase/maximize use of ITS capabilities Establish informational exchange network	Education and training programs
	Resolve institutional barriers Liberalize union work rules	Policy and regulation setting
		Memoranda of Understanding/Agreement

¹Buffalo Area-Specific User Service²By Others; Interface Required

TABLE 6
PRELIMINARY CANDIDATE ACTION LIST

USER SERVICE	OBJECTIVE(S) MET	CANDIDATE ACTION(S)
<i>Goal: Increase Transit Usage</i>		
Interorganizational/ International Management and Coordination ¹	Alter public perceptions Enhance transit services	Public relations programs
Public Transportation Management	Improve schedule adherence	Route/schedule information
En-Route Transit Information	Provide “competitive” travel options; Reduce SOV use;	Pre-emption/bypass facilities
	Improve multimodal access information	Transit vehicle priority
		Exclusive transit facilities
Public Travel Security	Improve personal security	On-board monitoring/surveillance
<i>Goal: Leverage Financial Resources</i>		
Financial Management ¹	Identify funding mechanisms	Legislative changes
	Secure non-traditional financial partners	Public/private partnerships
	Investigate opportunities to create cost efficiencies	Interorganizational memoranda of agreement/understanding
	Balance capital & operating expenditures	
Interorganizational management and coordination ¹	Promote cost sharing Change enabling legislation Improve public/agency awareness of needs Incr. staffing - critical needs Improve labor agreements	Continue with NITTEC
<i>Goal: Enhance Productivity and Performance (Services and People)</i>		
Operations Management ¹	Eliminate redundant functions	Information system integration
	Cross-train existing staff	Education and training
	Reduce site-to-site travel	Remote monitoring of physical environment
	Streamline work processes	Electronic information dissemination
	Manage construction schedules	Hazard prevention
	Maintain “drivable” roadway surfaces	GIS database
		Interagency agreements
Interorganizational Management and Coordination ¹	Promote resource sharing	Pavement management system
		Continue with NITTEC

¹Buffalo Area-Specific User Service²By Others; Interface Required

TABLE 6
PRELIMINARY CANDIDATE ACTION LIST

USER SERVICE	OBJECTIVE(S) MET	CANDIDATE ACTION(S)
Goal: Facilitate Traveler Mobility (Residents and Visitors)		
En-Route Driver Information	Reduce unnecessary trip making Provide reliable/accurate travel information Manage/plan special event/destination traffic	Facility monitoring surveillance
Pre-Trip Travel Information		Electronic information dissemination
Route Guidance		In-vehicle navigation
En-Route Transit Information		
Traffic Control	Manage/plan special event/destination traffic	Advance information advisories
Public Transportation Management		Preplanned traffic control strategies
		Access/parking guidance/capacity
Traveler Services Information	Capture economic benefits	Information on attractions/destinations
		Private sector participation
Goal: Maintain Privacy		
Interorganizational/ International Management and Coordination ¹	Protect proprietary data	Selective information storing
	Safeguard individual liberties	“Dummy” identification tags for remote data collection
		Protected information access
Goal: Inform/Educate the Public		
Interorganizational/ International Management and Coordination ¹	Use media to promote a positive, proactive approach Develop and implement marketing strategies	Press releases
		Advertising campaign
		Educational campaign

¹Buffalo Area-Specific User Service²By Others; Interface Required

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TABLE 7
PERFORMANCE CRITERIA

USER SERVICE	OBJECTIVES	PERFORMANCE MOE	APPROACH TO MONITORING
<i>Goal: Manage Congestion</i>			
En-Route Driver Information	i) reduce delay, fuel consumption, emissions	• reduced congestion delay	• derive from detected volume and speeds
	ii) provide downstream traffic condition advisories	• reduced travel time	• detect speeds
	iii) provide information on alternate routes	• reduced fuel consumption	• calculate as a function of delay
		• reduced emissions	• calculate as a function of delay
Route Guidance	i) reduce VMT	• reduced congestion delay	• derive from detected volume and speeds
	ii) provide information on quickest route	• reduced travel time	• detect speeds
		• reduced fuel consumption	• calculate as a function of delay
		• reduced emissions	• calculate as a function of delay
Pre-Trip Travel Information Demand Management	i) reduce peak period demand	• reduced demand volumes	• detect volume and speeds
	ii) manage/plan special event traffic	• reduced congestion	• derive from volume and speeds
Traffic Control	i) increase road capacity	• increased throughput	• detect volumes

**TABLE 7
PERFORMANCE CRITERIA**

USER SERVICE	OBJECTIVES	PERFORMANCE MOE	APPROACH TO MONITORING
Incident Management	i) reduced delay, fuel consumption, emissions ii) facilitate obstruction removals	• reduced non-recurring congestion delay	• derive from detected volume and speed
		• reduced travel time	• detect speeds
		• reduced fuel consumption	• calculate as a function of delay
		• reduced emissions	• calculate as a function of delay
		• reduced incident response time	• monitor detection, response, and clearance times
Electronic Payment Services	i) expedite toll collection	• increased throughput	• detect volumes
		• decreased operating costs	• monitoring staffing costs
		• reduced delay	• monitor queuing
		• reduced fuel consumption	• calculate as a function of delay
		• reduced emissions	• calculate as a function of delay
Commercial Fleet Management	i) improve hazardous material monitoring and response ii) reduce peak period demand	• reduced incident response time	• monitor detection, response and clearance times
		• reduced peak period commercial vehicle demand volumes	• detect heavy vehicle volumes
Public Transportation Management	i) manage/plan special event/destination traffic	• improved travel times	• monitor trip times
		• improved service reliability	• monitor schedule adherence for on-time performance
Goal: Minimize Adverse Weather Effects on Travel			

**TABLE 7
PERFORMANCE CRITERIA**

USER SERVICE	OBJECTIVES	PERFORMANCE MOE	APPROACH TO MONITORING
En Route Driver Information Pre-Trip Travel Information Collision Avoidance Vision Enhancement Automated Highway Systems	i) reduce accident frequency	• reduced accident rate during inclement weather	• track accident reporting for inclement weather conditions
Traffic Control	i) control known trouble locations	• reduced traffic volumes	• detect traffic volumes for trouble locations during inclement weather
Road/Weather Information Service	i) provide reliable road/weather information	• accurate reporting of weather conditions and road events	• random periodic investigation of report accuracy
Emergency Vehicle Management	i) effectively deploy incident management equipment	• reduced event response times	• monitor detection and response times
		• reduced incidence of inappropriate response	• review operations log

**TABLE 7
PERFORMANCE CRITERIA**

USER SERVICE	OBJECTIVES	PERFORMANCE MOE	APPROACH TO MONITORING
<i>Goal: Improve Safety</i>			
En-route Driver Information Collision Avoidance Vision Enhancement Automated Highway Systems	i) reduce accident frequency	• reduced secondary accidents	• track accident records
		• reduced primary accidents	• review police records
Emergency Notification and Personal Security Safety Readiness Pre-Crash Restraint Deployment	i) reduce accident severity ii) increase personal security	• reduced property damage, injury and loss of life	• review accident records
		• reduced personal security violations	• review police records
		• increased apprehension of personal security violators	• review police records
Incident Management Hazardous Materials Incident Response Emergency Vehicle Management	i) improve incident response/removal time ii) improve reporting and sharing of information	• reduced incident response time	• monitor detection, response and clearance times
		• reduced incidence of inappropriate response	• review operations log

**TABLE 7
PERFORMANCE CRITERIA**

USER SERVICE	OBJECTIVES	PERFORMANCE MOE	APPROACH TO MONITORING
<i>Goal: Increase Processing Efficiency (at Border Crossings)</i>			
Traffic Control Customs/Immigration Inspection & Clearance Commercial Vehicle Electronic Clearance	i) Expedite on-site credential processing	• increased throughput	• detect volumes
		• decreased operating costs	• monitor staffing costs
		• reduced delay	• monitor queuing
		• reduced fuel consumption	• calculate as a function of delay
		• reduced emissions	• calculate as a function of delay
Interorganizational/Int'l Mgmt. and Coordination	i) provide adequate staff	• increased throughput	• detect volumes
Electronic Payment Services	i) enhance collection handling	• increased throughput	• detect volumes
		• decreased operating costs	• monitor staffing costs
		• reduced delay	• monitor queuing
		• reduced fuel consumption	• calculate as a function of delay
		• reduced emissions	• calculate as a function of delay
Commercial Vehicle Administrative Processes Demand Management and Operations	i) eliminate unnecessary processes	• reduced cost	• financial audit
	ii) coordinate functions/processes between sites		

TABLE 7
PERFORMANCE CRITERIA

USER SERVICE	OBJECTIVES	PERFORMANCE MOE	APPROACH TO MONITORING
<i>Goal: Ensure Cooperative Spirit/Elevate Interorganizational Interaction</i>			
Interagency Management and Coordination	i) develop common goals ii) coordinate plans/programs/activities/ processes iii) develop common term iv) reduce overlap in roles/responsibilities/ functions v) share resources vi) maintain autonomy vii) promote/improve public agency image vii) increase/maximize use of ITS capabilities viii) establish informational exchange network ix) resolve institutional barriers x) liberalize union work rules	<ul style="list-style-type: none"> • increased information exchange • reduced operations cost • improved service responsibility • improved incident response 	<ul style="list-style-type: none"> • financial audit • agency surveys

**TABLE 7
PERFORMANCE CRITERIA**

USER SERVICE	OBJECTIVES	PERFORMANCE MOE	APPROACH TO MONITORING
Goal: Increase Transit Usage			
Interagency Management and Coordination	i) alter public perceptions	• level of service	• user surveys
	ii) enhance transit services	• level of service	• review coverage, travel times, access
Public Transportation Management En-Route Transit Information	i) improve schedule adherence	• improved service reliability	• monitor schedule adherence for on-time performance
	ii) provide "competitive" travel options	• improved travel times, access	• monitor trip times
	iii) reduce SOV use	• increased average occupancy	• random occupant surveys
Public Travel Security	i) improve personal security	• reduced personal security violations	• review police records
		• increased apprehension of violators	• review police records
Goal: Leverage Financial Resources			
Financial Management	i) identify funding mechanisms ii) secure non-traditional financial partners iii) investigate cost efficiencies iv) promote cost sharing	• increaed benefit/cost • reduced costs	• financial audit
Interorganizational/ International Management and Coordination	i) promote cost sharing ii) change enabling legislation as needed iii) improve awareness of needs iv) increase staffing for critical needs v) improve labor agreements	• increased benefit/cost • reduced costs	• financial audit
Goal: Enhance Productivity and Performance (Services and People)			

**TABLE 7
PERFORMANCE CRITERIA**

USER SERVICE	OBJECTIVES	PERFORMANCE MOE	APPROACH TO MONITORING
Operations Management	i) eliminate redundant functions ii) cross-train existing staff iii) reduce site-to-site travel iv) streamline work processes v) manage construction schedules vi) maintain "drivable" roadway surfaces	<ul style="list-style-type: none"> • reduced operations costs 	<ul style="list-style-type: none"> • financial audit
Interorganizational/ International Management and Coordination	i) promote resource sharing	<ul style="list-style-type: none"> • reduced operations costs 	<ul style="list-style-type: none"> • financial audit
<i>Goal: Facilitate Traveler Mobility (Residents and Visitors)</i>			
En-Route Driver Information Pre-Trip Travel Information Route Guidance En-Route Transit Information	i) reduce unnecessary trip making ii) provide reliable/accurate travel information iii) manage/plan special event/destination traffic	<ul style="list-style-type: none"> • increased throughput 	<ul style="list-style-type: none"> • user surveys
Traffic Control Public Transportation Management	i) manage/plan special event/destination traffic	<ul style="list-style-type: none"> • reduced special event recurring congestion 	<ul style="list-style-type: none"> • monitor vehicle volumes and speeds for special events
Traveler Services Information	i) capture economic benefits	<ul style="list-style-type: none"> • reduced individual travel time 	<ul style="list-style-type: none"> • traveler surveys
<i>Goal: Maintain Privacy</i>			

**TABLE 7
PERFORMANCE CRITERIA**

USER SERVICE	OBJECTIVES	PERFORMANCE MOE	APPROACH TO MONITORING
Interorganizational Management and Coordination	i) protect proprietary data ii) safeguard individual liberties	<ul style="list-style-type: none"> increased public acceptance 	<ul style="list-style-type: none"> user surveys
<i>Goal: Inform/Educate the Public</i>			
Interorganizational Management and Coordination	i) use media to promote a positive, proactive approach ii) develop and implement marketing strategies	<ul style="list-style-type: none"> increased public knowledge of traffic and traveler management 	<ul style="list-style-type: none"> user surveys